EMOTION PROCESSING

in

ALEXITHYMIA

by

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Abstract

Alexithymia refers to a lack of words for feelings and is considered to be a personality trait, leaving a person at risk for psychiatric and psychosomatic disorders. A reliable measure of alexithymia, the Toronto Alexithymia Scale-20 comprises three factors which reflect the affective, cognitive and behavioural characteristics of the disorder: difficulty in identifying emotion, difficulty in describing emotion and externally oriented thinking. The construct is associated with low positive affectivity (PA) and high negative affectivity (NA).

The goal of these studies was to disentangle NA and alexithymia, and to investigate the structural or functional impairment in emotion processing. There were 46 male and 100 female volunteer subjects, aged between 17 and 55, who participated in three studies. Subjects discriminated between facial identity and facial expression given temporal constraint in Study 1, and between facial expression of emotion stimuli and neutral expressions given temporal constraint in Study 2. In Study 3 subjects colour named emotion and arousal words in a Stroop Task.

In Study 1 all subjects were significantly more accurate in the identity condition. In Study 2 high alexithymics were significantly less accurate in the recognition of emotion given temporal constraint. Subjects with the greatest difficulty in describing emotions were the most impaired. There was a significant difference in the recognition of sad, angry and fearful stimuli. NA appeared to have a significant effect on perceiving differences in Study 1, but not in recognizing emotions in Study 2. While there were no

between group effects in Study 3, there was a significant difference between conditions, with response time quickest for the baseline, and slowest for the arousal condition.

These studies provide support for alexithymia as a viable construct. They help to disentangle NA and alexithymia, with NA having a significant effect in the attention stage of processing and alexithymia appearing to be a functional deficit, associated with difficulty in describing emotion, in the recognition stage of emotion processing. There appear to be overall differences in the accuracy of recognizing sadness, anger and fear. These studies also demonstrate that time, or temporal constraint, has a significant affect on emotion processing.

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CHAPTER ONE

Introduction

Alexithymia is a term coined initially by Sifneos in 1972 to refer to a lack of words for feelings: a (=without), lex (=word) and thymia (=feeling). The construct encompasses a cluster of affective, cognitive and behavioural characteristics observed in people, often psychiatric patients with psychosomatic complaints. A common denominator appears to be difficulty in identifying and describing emotions. This factor may be accompanied by reduced fantasy involvement, occasional outbursts of emotion, stiffness and paucity in facial expression, externally oriented and concrete thinking and confusion over discriminating between bodily sensations and emotions.

Alexithymics have been described as at risk for psychosomatic and psychiatric disorders (Taylor, 1994). They present a challenge for therapy since they do not respond well to insight psychotherapy (Taylor, 1984). The aim of the present study was to shed some light on possible differences in emotion processing between alexithymics and non alexithymics by focusing on detection, attention, perception and cognition mechanisms.

The Toronto Alexithymia Scale-20 (TAS-20) was used to identify high, moderate and low alexithymics using a non-clinical student population. The Positive and Negative Affect Schedule (PANAS) was also used in order to identify subjects who were high and low in negative affectivity. While the two constructs, negative affectivity (NA) and alexithymia are associated and tend to overlap, it has been suggested that they are independent of one another (Lane et al., 1996). This study attempted to more clearly identify and disentangle these constructs. A hypothesis was that there is a distinction

between the negative affectivity and alexithymia constructs, since it was expected that some subjects would be both high alexithymic and high NA, and others would be low alexithymic and high NA.

Much of the literature concerning alexithymia has been on construct validity (Bagby, Parker, & Taylor, 1994; Bagby, Taylor, & Parker, 1994; Linden, Wen, & Paulhus, 1995; Taylor, 1994; Parker, Bagby, Taylor, Endler, & Schmitz, 1993). Personality correlates of alexithymia have also been widely researched (Fukunishi & Rahe, 1995; Kauhanen, Kaplan, Julkunen, Wilson, & Salonen, 1993; Parker, Taylor, Bagby, & Acklin 1993; Rubino, 1995). Health related issues constitute a third major area associated with alexithymia (James & Large, 1991; Jimerson, Wolfe, Franko, Covino, & Sifneos, 1994; Kauhanen, Kaplan, Cohen, Salonen, & Salonen, 1994; Millard & Kinsler, 1992; Newton & Contrada, 1994; Sivik, 1993; Wheeler & Broad, 1994). Several studies to date have investigated physiological reactivity in alexithymia (Martin & Pihl, 1986; Newton & Contrada, 1994; Wehmer, Brejnak, Lumley, & Stettner, 1995). Others have indicated that alexithymia is associated with a deficit in accurately interpreting emotional stimuli, but results are conflicting (Berenbaum & Prince, 1994; Lane et al., 1996; McDonald & Prkachin, 1990; Parker, Taylor, & Bagby, 1993a; Parker, Taylor, & Bagby, 1993b).

The alexithymia construct is somewhat of a paradox, in that subjects can and do identify, describe and express emotions; yet by definition the construct implies that they have no words for feelings. In order to complete the TAS-20, an awareness of emotion has to be present. The aim of this project was to continue investigating and replicating in part previous studies of the recognition of emotional stimuli by alexithymics. Emphasis

was placed on understanding detection processes, attention mechanisms and the integration of sensory information in alexithymics, to see where they may differ from non-alexithymics.

This construct is pivotal to the emotion-cognition debate. It is argued on the one hand that emotion and cognition are independent processes, and on the other hand that emotion is conditional on cognition (Buck, 1993; Dodge, 1991; Lazarus, 1982; Lazarus, 1991; Zajonc, 1980). In order to better understand alexithymia, there is a need to understand how emotions are processed, with particular attention to the negative emotions which seem to cause the alexithymic most confusion, and discomfort (Berenbaum & James, 1994; McDonald & Prkachin, 1990; Taylor, 1994). Based on findings of personality correlates with the TAS-20 (Bagby, Taylor, & Parker, 1994), alexithymics appear to be poor at differentiating between components of emotional distress, occasionally exhibiting rage or sobbing but without being able to elaborate on what they are feeling (Taylor,1984). Differences in sensory processing may lead to differences in cognitive appraisal and therefore emphasis will be on understanding alexithymic behaviour through an understanding of the neurological substrate. The literature review includes recent studies on attention mechanisms, fear processing systems and multimodal sensory information processing mechanisms.

Alexithymia is a potential drain on our health care system since alexithymics may be presenting in considerable numbers in medical clinics with somatoform disorders (Taylor, 1984). There is evidence of early or possibly unnecessary diagnosis of coronary heart disease in angina patients with alexithymic characteristics (Kauhanen et al., 1994).

However, prospective studies investigating the predictive validity of the TAS-20 for psychosomatic disease and psychiatric disorders are needed. Without a clear understanding of how alexithymics may differ from the normal population in emotion processing, it will be difficult, if not impossible to address the need for adequate diagnosis and ensuing therapy. Work by Hudley and Graham (1993) on attributional bias suggests that cognitions and emotions work independently and not sequentially, and that social cognitive behavioural therapy may change cognitions but not emotions. If there is a pre-appraisal emotion processing difference for alexithymics, therapy will be needed to address that particular difference.

CHAPTER 2

Literature Review

Alexithymia is a relatively new construct (Sifneos, 1972). However, there has been a steadily increasing amount of literature concerning this deficit. Interest in the construct is probably due to the fact that alexithymia is thought to be associated with many other disorders. However, the high level of interest also indicates that researchers are not only taking the construct seriously, but that it appears to be important to the understanding of certain health related disorders. The review of the literature touches briefly on the measurement of alexithymia and associated disorders. The main objective, however, is to narrow the field to the area of emotion processing, and its biological substrate, with particular emphasis on the 'fast-tracking' of sensory information. Further issues explored in the literature review include the physiology associated with alexithymia, the cognizing of emotions and the effect of cognizing on health, 'blindsight', the role of language in emotional awareness and the effects that possible deficits in emotion processing may have on psychosomatic illness. The emotion-cognition debate is briefly reviewed since alexithymia may, as a construct, shed some light on the interaction of cognition and emotion in information processing. Findings from these studies may have theoretical implications for the primacy of emotion.

2.1 Measuring Alexithymia

A review of the assessment of alexithymia (Linden, Wen, & Paulhus, 1995) focused on seven instruments: the Beth-Israel Questionnaire, the Schalling-Sifneos Personality

Scale, the Alexithymic Provoked Response Questionnaire, the Minnesota Multiphasic Personality Inventory Alexithymic Scale, the Archetypal Test, the Toronto Alexithymia Scale and the Analog Alexithymia Scale. Evidence suggests that the self report measure, the Toronto Alexithymia Scale-20 (TAS-20), has adequate reliability (Cronbach's alpha = .81) and test-retest reliability (.77) in both clinical and non-clinical populations (Bagby, Parker, & Taylor, 1994; Taylor,1994). Moderate discriminant validity is reported and high convergent and concurrent validity (Bagby et al.). Bagby et al. reported a strong and negative correlation (-.55) between the TAS-20 and the Need for Cognition Scale (Caccioppo, Petty, & Kao, 1984), and the Psychological Mindedness Scale (-.68; Conte et al., 1990), and a significant correlation between the TAS-20 and the Beth Israel Hospital Psychosomatic Questionnaire (Sifneos, 1973). Using the NEO Personality Inventory (Costa & McCrae, 1985), Bagby et al. reported a non-significant correlation of the TAS-20 with the traits of agreeableness, conscientiousness, excitment-seeking and activity. Replication, however, is needed in diverse cultural groups (Parker, Bagby, Taylor, Endler, & Schmitz, 1993). Criticisms of this scale include the fact that there has not been enough clinical validation, there is overlap of TAS-20 items with negative affectivity (NA) measures, and the fact that three independent factors have to be considered for the diagnosis of alexithymia (Linden, Wen, & Paulhus, 1995).

This scale originally comprised four factors and has been shortened and revised as the TAS-20, (Bagby, Parker & Taylor, 1994), by dropping the daydreaming factor. It now includes three factors: Difficulty in Identifying Feelings (Factor I), Difficulty in

Describing Feelings (Factor II), and Externally Oriented Thinking (Factor III) where Factors I and II correlate, and Factors II and III correlate (Bagby et al., 1994).

2.2 Construct Validity of the TAS-20: A Pilot Study

A pilot study (Parker & Prkachin, 1995) conducted at UNBC evaluated the construct validity of alexithymia by examining convergence and divergence of the TAS-20 with other stable measures of affect. These measures included the Positive and Negative Affect Schedule or PANAS (Watson, Clark, & Tellegen, 1988), the Social Support Measure or SSM (Seeman & Syme, 1987), the Interpersonal Reactivity Index or IRI (Davis, 1983) measuring empathy and interpersonal reactivity, the State University of New York Psychosomatic Symptom Checklist or SUNYA (Attanasio, Andrasik, Blanchard, & Arena, 1984), the Interest and Preference Test or IPT (Zuckerman, Eysenck, & Eysenck, 1978) measuring sensation seeking, the Improvisational Situations Test or IST (Fletcher & Averill, 1984) measuring fantasy proneness, and the Affect Intensity Measure or AIM (Larsen, Diener, & Emmons, 1986).

A wide range of factors have been associated with alexithymia. These behavioural aspects tend to correlate either with the first and second factors, i.e. identification and expression of emotion, or with the third factor, externally oriented thinking. In the above mentioned pilot study (Parker & Prkachin, 1995) Factor I correlated significantly with the SUNYA scale measuring psychosomatic disorders (.4), with the PANAS scale measuring low positive affect (-.32), and high negative affect (.47) and with the IRI measuring personal distress (.28). Factor II correlated significantly with the IRI measuring personal distress (.23), with the PANAS meauring high negative affect (.23) and with the SSM

measuring lack of social support (-.29). Factor III was also significantly associated with the PANAS measuring high negative affect (.31), with the IPT measures of boredom (.26), and disinhibition (.23), and with the IRI measures of empathy (-.51), lack of perspective taking (-.33), and reduced fantasy (-.27). This diversity reflects in part the independent sensory, cognitive and behavioural elements of the construct.

A later factor analytic study (Parker, 1995), based on the data from the 77 UNBC psychology students' responses in the pilot study, was not consistent with the interfactorial correlations found by Bagby et al. (1994), and revealed low interfactorial correlations for the TAS-20 factors. This lack of interfactorial correlation may have been due to the homogeneity and comparatively small sample size (n=77) of the pilot study (Parker & Prkachin, 1995). It may possibly reflect the distinctiveness of the facets comprising the alexithymia construct. There appears to be independence of the three basic components: confusion over identifying emotion, difficulty in describing emotion, and lack of psychological insight, or externally oriented thinking. These factors may reflect in part different neurological mechanisms responsible for the whole construct. The affective component or confusion over identifying emotion may impinge on the cognitive component or difficulty in verbalizing emotion, which in turn may lead to a behavioural component, or externally oriented thinking. The TAS-20 may be measuring broadly a progression of sensory, cognitive and behavioural aspects of the alexithymia construct, and may reflect the spectrum of biopsychosocial facets of the construct which are open to disentanglement and investigation.

The TAS-20 appears to be an effective measure of alexithymia, although some of the items in the pilot study cross loaded and had low communalities. While this may have been due to the small sample size (n=77), these items also appear to load differently depending on cultural differences (Parker, Bagby, Taylor, Endler, & Schmitz, 1993). While an overview of the literature suggests that many of the studies on alexithymia concentrate on the first two factors (difficulty in identifying and describing emotion), and tend to exclude or ignore the third factor (externally oriented thinking) in their analyses (Berenbaum & James, 1994; Berenbaum & Prince 1994; Prince & Berenbaum, 1993; Rubino, 1995), the above pilot study revealed that the items loading onto Factor III remained the most cohesive even in a five factor analysis. Evidently more work is needed on structuring the TAS-20, although it appears to be the most reliable, current measure of alexithymia, and the easiest to administer, being a self-report measure (Linden, Wen, & Paulhus, 1995).

2.3 The Construct of Alexithymia: A General Review

Alexithymia appears to be independent of socio economic status and general intelligence (Taylor, 1994). Investigators have found that alexithymia has an inverse relationship to psychological mindedness, verbal IQ, empathy, need for cognition, social support, positive affect, constructive daydreaming, anger out, hypnotizability, attentional control, disclosure, phobia, social hedonia, coping, social desireability, ego strength and controllability over emotions (Fukunishi & Rahe, 1995; Linden, Wen, & Paulhus, 1995; Prince & Berenbaum, 1993; Rubino, 1995; Taylor, 1994).

A positive relationship has been identified for depression, trait anxiety, somatization, anger in, negative affect, symptom reporting, guilt and fear of failure daydreaming, substance abuse, eating disorders, physical hedonia, post traumatic stress disorder (PTSD), and panic (Linden, Wen, & Paulhus, 1995; Taylor, 1994). While alexithymia is positively related to depression, there is evidence to suggest that it is a separate construct. Parker, Bagby, and Taylor (1991) found virtually no overlap in their correlation matrix comprising items from the Beck Depression Inventory (BDI) and the TAS. Clients assessed as both alexithymic and depressive have been shown to retain their alexithymic characteristics after treatment for depression (Haviland, Shaw, Cummings, & MacMurray, 1988).

There may be both primary and secondary alexithymia, although differentiating between the two requires both prospective and retrospective studies. Primary alexithymia may indicate a genetic or inherited trait, such as a neurophysiologically based disposition to experience anhedonia or somatization (Fukunishi & Rahe, 1995; Taylor, 1984). Secondary alexithymia is a term used for people who begin to manifest alexithymic traits later in life, and might be a reaction to say, stress, childhood trauma, or somatic disease (Fukunishi & Rahe, 1995). Secondary alexithymia has been associated with PTSD and with environmental factors in the home, such as lack of positive communication (Berenbaum & James, 1994), and could be confounded with other psychological problems, such as depression, eating disorders, or poor social coping skills (Jimerson et al., 1994; Kauhanen et al, 1993; Prince & Berenbaum, 1993). It would seem to be important to clarify and understand the issues underlying primary alexithymia, before

considering the possibility of secondary alexithymia. Although the two behaviours may appear the same, they are not necessarily caused by the same structural or functional deficit, and they may not require the same type of therapy.

There seems to be evidence to suggest that primary alexithymia is a personality trait (Fukunishi & Rahe, 1995; Taylor,1994). Based on correlations of the TAS-20 with the NEO personality Inventory (NEO-PI) as a measure of five basic dimensions of personality (Bagby, Taylor & Parker,1994), Taylor (1994) believes that alexithymia should be viewed as a dimension rather than a category, with high alexithymics exhibiting a deficiency of affect at one end of a personality continuum. The construct appears to be cross-cultural (Taylor, 1987).

2.4 Psychosomatic Illness and Alexithymia

It has been suggested that internalizing emotions rather than spontaneously expressing those emotions, may be associated with psychosomatic illness. A common element in psychosomatic patients, be they alexithymics, repressors or internalizers, appears to be a difficulty in verbalizing emotions, and then expressing them (Buck, 1984). Repression and alexithymia, though similar, appear to be different constructs (Myers, 1995). Repressors are thought to actively focus attention away from threatening stimuli and minimize the cognitive impact, exhibiting high arousal and low subjective expression (Weinberger, 1990). Alexithymics behave differently and are more similar to high anxious subjects. They report subjective anxiety yet measures of their physiological activity are lower than repressors (Newton & Contrada, 1994). Lower levels of physiological reactivity, higher baseline heart rate and tonic activity have been confirmed in several

studies on alexithymia; alexithymics seem to be physiologically distinct from repressors, low disclosers and internalizers (Wehmer, Brejnak, Lumley, & Stettner, 1995).

Difficulty or confusion over how one is feeling may impinge negatively on health outcomes through the inability to label and identify an emotion. One of the reasons for attempting to understand the alexithymia construct better is to help identify those people who lack the psychological insight necessary for psychotherapy. It has been suggested that up to thirty percent of patients presenting in medical clinics are displaying psychosomatic disorders associated with alexithymic characteristics (Taylor, 1984). They appear to be difficult to diagnose (Kauhanen et al., 1994). Confusion over bodily feelings may lead a person to misinterpret an emotion such as sadness, and assess it as hunger, leading to eventual eating disorders (Jimerson et al., 1994; Wheeler & Broad, 1994). There seems to be a need for some brief measure to help the practitioner determine whether these patients are having difficulty in discriminating between physical and emotional sensations. Administration of such a measure might help in determining the focus of treatment. It would also seem to be important to consider the causes for and reasons behind the manifestation of this disorder by pinpointing the neurophysiological mechanisms linking alexithymia with psychosomatic disorders and symptoms since alexithymics do not appear to benefit from traditional insight oriented therapy (Taylor, 1994). An understanding of the neurophysiological processes should help in modifying therapeutic treatment. Taylor (1994) suggests raising alexithymics' emotional experience from the sensorimotor to a more sophisticated representational level, whilst allowing the client to feel more comfortable using emotions intra and interpersonally.

2.5 Negative Affectivity Associated with Alexithymia

Alexithymics are apparently predisposed to experience undifferentiated distress, with emotional impairment occurring within the interface between perception and cognition. They appear to be implicitly extracting information from the environment realizing that something is amiss, and then they appear to seek medical help in symptom reporting, rather than assessing their level of emotional distress. In their confusion they require help interpreting sensations, apparently being unable to make the implicit-explicit or cognitive-affective connection, thereby acknowledging little controllability over their emotions (Newton & Contrada, 1994): somewhat similar to patients experiencing a panic attack. Low or negative affectivity may impact negatively on an individual's socialization. High negative affectivity may imply that a person is attending to danger or is more vigilant: this vigilance may help or inhibit the individual depending on the situation. High positive affectivity, on the other hand, may imply that a person is more flexible and therefore better able to attend more freely to their environment. Fridja (1986) predicts a negative balance for quality of life without some form of self deception, self-denial and self defense. Repressors report both low NA and low alexithymic traits, while alexithymics tend to report high NA (Myers, 1995). While repressors, internalizers and low disclosers may be practising avoidance, it seems unlikely that alexithymics are repressing or denying information (Newton & Contrada, 1994). They appear rather to be naive or confused, and to be at a loss as to what is happening to themselves emotionally. It seems, therefore, unlikely that alexithymics are in a position to practise self-deception. Negative emotions tend to persist under adverse conditions, while positive emotions disappear with

continuous satisfaction in hedonic asymmetry (Fridja, 1986). There is some evidence that positive and negative affectivity may be independent dimensions (Clark & Watson, 1994). Alexithymics seem to have a reduced ability to discriminate among the negative emotions (Taylor,1994), and a deficit in the spontaneous expression of negative affect (McDonald & Prkachin, 1990) may reflect differences between alexithymics and controls in the processing of negative affectivity. McDonald and Prkachin (1990) suggested that a deficient threat appraisal mechanism might underlie alexithymics' lack of affective language.

2.6 Cognizing and Related Health Issues

Cognizing, or affective-cognitive integration may be beneficial to health and mental wellbeing (Pennebaker & Hoover, 1983). When people cognitively confront and verbalize emotional or traumatic events they seem to feel and do better (Pennebaker, Hughes, & O'Heeron,1987; Spiegel, 1995). It may be that symbolic representation of emotional experience leads to greater emotional equilibrium. It is possible that some people, such as alexithymics, fail to deal with an emotion and confuse emotional arousal with somatic distress. Initial verbalization may intensify the negative experience momentarily but it may reduce the individual's vulnerability for future distress (Lane & Schwartz, 1987): in other words, short term pain for long term gain. Similar to PTSD clients, alexithymics appear to be unable to easily identify, express or label emotions even though they seem aware of their presence.

The way people deal with threatening stimuli may affect their ability to cognize. This in turn may indirectly affect their ability for disclosure of emotion. Fear and

inhibition have been associated with the prefrontal cortex of the right hemisphere (Kalin, 1993). Lexical decision however, is associated with the left hemisphere with the corpus callosum required for transfer of higher level information (Hoptman & Davidson, 1994). If alexithymics are experiencing difficulty in integrating the cognitive lexical aspect of emotion with the incoming sensory information, whether exteroceptive or interoceptive, they may be demonstrating by default that verbalization is the brain's way of by-passing right frontal inhibition. By focusing attention away from that particular fear circuit or at least allowing a feedback loop, reassessment of fear may be modified and then integrated with other sensory information. Labelling a problem may lead to a healthier and more functional secondary cognitive appraisal. Dispositional negative affect has been associated with greater right anterior activation (Davidson, 1994). There has been the suggestion that alexithymia is linked with deficits in interhemispheric transfer (Zeitlin, Lane, O'Leary, & Schrift, 1989). Cognitive flexibility and the ability to attend to, and switch from, one or the other hemisphere has been demonstrated in high hypnotizable subjects (Crawford & Gruzelier, 1992). While there seems to be a positive correlation between verbal IQ and hypnotizability (James & Large, 1991), alexithymia appears to have an inverse relationship to hypnotizability (Linden, Wen, & Paulhus, 1995). A reduced ability to disclose traumatic or emotional information may have ramifications for health (Pennebaker, Kiecolt-Glaser, & Glaser, 1988; Petrie, Booth, Pennebaker, Davison, & Thomas, 1995). It seems likely, therefore, that a deficit in verbalizing emotions, whatever the neurological cause of that deficit, may have an impact on health.

2.7 Recognizing Emotional Stimuli

Since the field for exploring the construct of alexithymia is so broad, the focus in this study will be on possible differences between alexithymics and non-alexithymics in initial sensory information processing, or the area of perception with emphasis on detection, attention and multimodal integration. There is evidence to suggest that alexithymics are less accurate than non alexithymics in the recognition of verbal and nonverbal emotional stimuli (Lane et al., 1996; Parker, Taylor, & Bagby, 1993a; Parker, Taylor, & Bagby, 1993b) although Berenbaum and Prince (1994) suggest that interpretation, rather than accuracy in identifying emotion, should be the focus of future research.

Differences in attention mechanisms between alexithymics and controls have been implicated (Parker, Taylor, & Bagby, 1993a). The Stroop task (Stroop, 1935) is used to study attentional processes. Subjects are asked to identify the colour in which a word is written, rather than its meaning. When the meaning of the word conflicts with the colour it is written in, there is interference with the subject's attentional processes. Alexithymics tend to be slower than controls on the Stroop task when arousal words are used, and comparable to controls on non-emotion evoking stimuli (Parker et al., 1993a). It is not known whether this difference is due to mechanisms of attention, imbalance within the sensory integration mechanisms, or problems with interhemispheric transfer time differences.

2.8 Biological Substrate to Recognition of Emotional Stimuli

Since the object of this study is to investigate emotional processing differences between alexithymics and controls, it is necessary to briefly describe the relevant biological mechanisms which may be involved in attention, recognition and perception of emotion. If there are differences in either salience and or reaction times when responding to emotional stimuli, attention mechanisms involving the posterior parietal cortex (PPC), the superior colliculus (SC), the pulvinar and the frontal cortex, are likely to be implicated. According to Posner and Petersen (1990), attention involves a network of anatomical functions, three of which are orienting to sensory events, detecting signals for focal or conscious processing and maintaining a vigilant or alert state. Shifting attention appears to involve the PPC, SC and posteriolateral thalamus. Lesions in the parietal lobe may affect the ability to disengage attention, while damage to the SC may affect the ability to shift attention, and damage to the thalamus may affect the ability to engage attention. A language attention system may involve the anterior cingulate gyrus, prefrontal cortex and posterior parietal lobe (Posner & Petersen, 1990).

Multimodal sensory integration is thought to involve the temporal lobe, specifically the superior temporal sulcus (STS). The temporal lobe and the STS appear to act as a multimodal sensory convergence area (Kolb & Whishaw, 1990). Lesions here result in deficits in language, affect and memory. Although it may not be possible to generalize from animal studies to humans, since phenomena in humans may be different to animals, studies of macaque monkeys indicate that the STS has cells which respond to faces, direction of gaze and head posture (Perrett et al., 1990). Walsh and Perrett (1994) have

further implicated the STS in selective attention to others' gaze. In a study of rhesus monkeys, gaze aversion and selective viewing were measured over the first few weeks of a monkey's life, by recording visual fixations while the monkeys were presented with faces looking away and at them. Responsiveness to faces was found to be associated with extreme emotionality in monkeys in their third week. Emotional responses were diminished by the seventh week, with implications for the prefrontal cortex (Mendelsohn, Haith, & Goldman-Rakic, 1982). Likewise, children between seven and twelve months show fear of strangers and increased activity in the prefrontal cortex. Regulation of fear in social referencing is modulated by interpreting expressions on another's face, with the prefrontal cortex important in discriminating between fearful or threatening stimuli (Kalin, 1993). Three fear regulating areas appear to be the amygdala (for fear generation), the prefrontal cortex (for assessing danger cognitively), and the hypothalamus (for neurochemical response). For the prefrontal cortex to efficiently assess danger there must be automaticity in interhemispheric transfer of higher level information; deficits in interhemispheric transfer have been implicated in alexithymia (Zeitlin et al., 1989). Hoptman and Davidson (1994) suggest that for cognitive and high level attentional functions 'temporal aspects of this interaction have been largely ignored' and that 'subcortical pathways are less efficient than cortical ones' (p.214). They suggest temporal analysis for interhemispheric interactions, with particular emphasis on attentional systems. These present studies investigated temporal aspects of emotion processing in attentional and recognition systems.

2.9 Emotion and Cognition

The construct of alexithymia seems to stand in the centre of the emotion-cognition debate. How does one define cognition and where is the line separating emotion and cognition? Which comes first in the path of information processing? Are they separate processes? One problem is that alexithymics are supposed to be people without words for emotions; however, they obviously have to be aware of a difficulty in emotion processing in order to be able to complete the TAS-20 measure. Perhaps alexithymia is similar to the notion of blindsight, where there is a demonstrated implicit knowledge while explicit knowledge remains hidden to the subject (Weiskrantz, 1986). Alexithymics may be relying on non-declarative and slower memory pathways for emotional situations as outlined by Petri and Mishkin (1994). Recent studies on alexithymia indicate a decoupling of physiological processes and subjective appraisal (Kauhanen et al., 1994; Martin & Pihl, 1986). While alexithymics may subjectively feel anxious, their physiological measures do not reflect this heightened arousal. Ratings of subjective experience and physiological arousal tend to move in opposite directions, with sympathetic activity remaining stable while subjective responses rise and appear dissociated from the physiological experience suggesting that some affective processes may be independent of appraisal and cognition. There may be two levels of processing, one for cognition and one for emotion, or there may be an imbalance of implicit and explicit levels of awareness, with less emotional stimuli entering focal awareness, or some hitch in the parallel feedback loops necessary for integration. It seems possible that alexithymia is a deficit of affective-cognitive integration due to the sensory stimulus being

assessed at slightly different moments by the affective and cognitive processes, leading to reduced automaticity in interhemispheric transfer and an ensuing lack of informational integration.

For the purposes of this study, cognition is held to be knowledge by description (DK). There is reflection, awareness, and knowledge about reality. Knowledge by acquaintence (AK) would be at the stage of detection: pre-cognitive, pre-appraisal, along Gibsonian lines of direct perception and extraction of information from the environment (Buck, 1993). Like agnosia, alexithymia may be a failure to transform AK into DK, a failure to put words to sensations. The stimulus is processed, but without meaning. Buck (1984) divided emotion behaviour into three components: autonomic and endocrine responses, expressive behaviours (as in facial expressions), and subjective experience. Integration of these three should be essential for emotional well-being. An emotional dysfunction may be investigated by examining these areas and their biological substrates. The aim of this study was to clarify where alexithymics differ from normal or healthy controls in emotion information processing and where the first point of divergence might lie. The underlying premise of this study was that alexithymics would differ from controls after the detection stage of information processing, since their visual mechanisms are likely to be intact, and there is evidence to suggest that they do not differ from normal subjects in visual recognition of non-emotional stimuli (Parker, Taylor, & Bagby, 1993a).

2.10 'Fast-tracking' of Sensory Stimuli

The higher baseline heart rate and tonic arousal of alexithymics (Wehmer et al., 1995) would suggest vigilant attention systems and habitual threat appraisal. Ledoux,

Sakaguchi, and Reis (1984) found support for the neurological bases of AK with evidence of an affective 'fast track' in the initial sensory processing which projects directly to the amygdala, an area thought to be crucial in emotion processing (Ledoux, 1993). This affective shortcut, which lacks contextual and identity information, is several synapses shorter than the neocortical route: sensory input may travel via the medial geniculate body (MGB) of the auditory system to the amygdala.

Sensory information about a stimulus may travel in two ways in a parallel processing system. Information about the stimulus features may exit the sensory thalamus via the extralemniscal areas and travel to the lateral nucleus of the amygdala, while at the same time parallel information may travel via the lemniscal nuclei or the extralemniscal nuclei to primary sensory association cortex areas (Ledoux, 1995). Direct projections from the sensory thalamus to the lateral nucleus of the amygdala have fewer synapses than stimulus feature information. This 'fast-tracking' system has temporal advantage, but lacks detailed information about the stimulus. This 'fast-track' system, therefore, has a temporal advantage over perceptual, contextual, memory and polymodal features processed in hippocampal or primary association cortex areas. The 'fast-track' pathways exit the ascending sensory system prior to object and event representation in the unimodal or polymodal cortex and hippocampus, allowing the amygdala to respond to simple features with incomplete stimulus information from the thalamus (Ledoux, 1993): a form of AK. This system may then take precedence over the more complete object information from the cortex, at the expense of perceptual precision (Ledoux, 1993), with implications for classical conditioning and lack of habituation (Ledoux, 1995).

If people are conditioned to avoid emotional stimuli, they are unlikely to attend to them, and through avoidance fail to learn to cognize such stimuli. Further behaviour is likely, therefore, to be manifested on the basis of the 'fast-tracked' information, rather than on the basis of information which has been implicitly identified and given a context. Alexithymia is associated with panic as opposed to phobia (Parker, Taylor, Bagby, & Acklin, 1993) which may support the theory that alexithymics tend to 'fast-track' information at the expense of identity information, since phobias tend to be for specific stimuli, while panic can be triggered by more generalized situational cues.

One might expect that people who may be processing emotional stimuli in this way would also have a higher baseline heartrate (HR) and tonic arousal, such as is found in alexithymia (Wehmer et al, 1995). Higher baseline tonic arousal and HR may affect the attention systems. Having a vague sensation of danger but without being able to symbolize, or verbalize the cause might also keep the subjective anticipation of danger at increased levels, and physiology on constant alert. This vigilence may lead to elevated cortisol and may damage hippocampal neurons, which are important in motivation, memory and emotion (Kalin, 1993).

Alexithymics' emotional distress or arousal seems to lack clear differentiation (Bagby, Taylor, & Parker, 1994), implying that they appear to experience most confusion when there is a need to discriminate among negative emotions (Taylor,1994). Ledoux (1995) suggested that individuals whose fear mechanisms are triggered via the subcortical amygdala route without the hippocampal connection would likely have limited emotional and psychological insight. He further pointed out that any such emotional memories are

likely to continue long after extinction of the emotional behaviour, and that therapy for such individuals may consist of trying to effect more efficient cortical synaptic links with the amygdala. Lesions to cortical connections lead to lack of extinction in classical conditioning. Alexithymics behave as if they have an impaired integration of affective and cognitive mechanisms. This may have led to lack of extinction or longer habituation for fearful memories due to overuse of the 'fast-track' sensory information processing, and possible avoidance of cognitively processing emotions, especially of sad, angry or fearful stimuli; similar to PTSD clients. Maturational studies suggest that the amygdala matures earlier than the hippocampus, which implies that early conditioning is non-declarative, and possibly inaccessible to memory (Ledoux, 1995). Dantzer (1991) points out that if a defense system is overused during childhood, this pattern may hold for adulthood and could explain the somatization characteristic of people high on the negative affect scale. He suggests competition between internal and external stimuli vying for a common behavioural pathway may lead some people to notice bodily sensations over social clues.

2.11 Summary and Purpose of Research

Alexithymia appears to be an impairment which is associated with many psychiatric and somatic disorders. It seems, therefore, important to investigate the structural and functional mechanisms underlying this disorder, so that early assessment and appropriate therapy may be implemented. Alexithymia is considered to be a personality trait, or a continuum, which is normally distributed in the population. The TAS-20 seems, at present, to be the most reliable measure of alexithymia and is easy to administer, being a self-report questionnaire. Alexithymia appears to be a deficit in emotion processing and

those with the greatest difficulty in identifying and describing emotions, are likely to also experience the greatest difficulty in disclosing their feelings. This deficit may have an negative effect on their health, and could contribute to psychosomatic disease, psychiatric disorders, or medical problems, such as eating disorders, panic attacks, or substance abuse (Taylor, 1994). Since alexithymics appear to be impaired rather than incapable of integrating cognitive and emotional information, this may be due to impaired fear processing, selective attention to non-emotional stimuli, reduced intermodal automaticity, and reliance on non-declarative and slower memory pathways for emotional situations.

The main purpose of this study was to concentrate on the mechanisms responsible for the deficit in verbalizing and identifying emotions. Particular emphasis was placed on the temporal aspects of emotion processing and the implications that any deficit in temporal processing might have on emotional awareness. The studies were exploratory in nature, and their purpose was to re-examine the relationship between alexithymia and the ability to attend to, recognize, identify, and integrate emotional stimuli. It was decided to examine selective attention to identity versus emotion stimuli, sensitivity to facial expressions of emotion versus neutral expressions, and response time to verbal expressions of emotion or arousal versus baseline or neutral words.

2.12 Hypotheses

Alexithymics appear to have a deficit in emotion regulation specifically in the integration of affective and cognitive stimuli. They seem to be deficient in the processing and elaboration of emotional stimuli, rather than in the initial detection of stimuli. While

they may be able to detect stimuli normally, they may be less able to shift attention or integrate affective-cognitive information.

The primary hypothesis was that although alexithymics might be able, given sufficient time, to recognize and identify emotional stimuli, their ability to do this would be eliminated or reduced, given temporal constraint. They might be receiving a 'fast-tracked' message, followed by more detailed information of the same stimulus. These two inputs would then arrive slightly out of synchronization in the sensory integration area, thereby slowing down the individual's response to the stimulus.

The second hypothesis was that alexithymics would only respond more slowly to emotional stimuli, and that their response to non-emotion stimuli would be similar to non-alexithymics, as in the Stroop task (Parker, Taylor, & Bagby, 1993a). Since alexithymia is associated with negative affectivity (NA), alexithymic subjects should be more distracted than non-alexithymic subjects by stimuli evoking states of negative emotional arousal, and be less able to attend to the task.

A third hypothesis was that the slowest response time would be for negative affect stimuli, i.e. anger, sadness or fear. This hypothesis was due partly to the premise that they might have a deficit in threat appraisal, and also to the idea that positive and negative affectivity are separate dimensions.

The fourth hypothesis was that this deficit might, in part, be due to selective attention to non-emotional stimuli. There is evidence to suggest that recognition of faces and processing of emotional facial expression are dissociated (George et al., 1993;

Humphreys, Donnelly, & Riddoch, 1993; Magnussen, Sunde, & Dyrnes, 1994; Prkachin & Prkachin, 1994; Young, 1992).

The fifth hypothesis was that NA and alexithymia are separate constructs, and that a deficit in the recognition of, or selective attention to, facial expressions of emotion stimuli, would be due to alexithymia, rather than NA.

The sixth and last hypothesis was that higher levels of alexithymia would result in a reduced ability to respond to emotional stimuli.

CHAPTER 3

Method

3.1 Subjects

There were 146 volunteers aged between 17 and 55 (M= 26.5). Of the 146 subjects, 79 were recruited from the UNBC Psychology subject pool. Students from the subject pool received bonus credit for testing. The remaining 67 subjects were recruited directly on campus. There were 46 males aged between 18 and 55 (M=25.76) and 100 females aged between 17 and 52 (M=26.8). There were 8 lefthanded subjects. Colour blind subjects were not accepted. There were 11 students (mostly Mandarin speakers) for whom English was a second language.

3.2 Measures

All subjects were administered two self-report measures: the Toronto Alexithymia Scale-20 (TAS-20; Bagby, Parker, & Taylor, 1994; see Appendix A), and the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988; see Appendix B). The TAS-20 has demonstrated internal consistency, good test-retest reliability, construct and criterion validity, and a stable and replicable three factor structure (Parker, Bagby, Taylor, Endler, & Schmitz, 1993). The three factors comprise: Factor I or Difficulty in Identifying Feelings, Factor II or Difficulty in Describing Feelings and Factor III or Externally Oriented Thinking. The scale consists of twenty items scored on a Likert scale with a possible score range from 20 to 100. The PANAS comprises two 10 item mood scales measuring positive and negative mood dimensions. There is a ten item

scale measuring negative affectivity (NA) and a ten item scale measuring positive affectivity (PA). The two scales contain adjectives describing different feelings. The respondent is asked to describe, using a 5 point Likert scale, the extent of each emotion experienced, in this case "on the average". The NA scale is internally consistent (Cronbach's alpha = .87), has high test-retest reliability (.71), with good convergent and discriminant validity (Watson, Clark, & Tellegen, 1988).

3.3 Materials

The visual stimuli for Studies 1 and 2 were created from Ekman and Friesen's Pictures of Facial Affect (1976). This was a set of 110 35mm black and white cardboard mounted slides, numbered and coded. Apart from neutral faces, depictions of only three emotions were utilized from the collection: sadness, anger and fear. Since Alexithymia is associated with low PA and high NA (Linden, Wen, & Paulhus, 1995) and difficulty in distinguishing between anger, sadness, and fear (Bagby, Parker, & Taylor, 1994; Taylor, 1994) the slides used portrayed negative emotions only. The facial expressions of surprise and disgust were not used, since disgust is hard to differentiate from anger, and surprise is hard to distinguish from fear (Prkachin & Prkachin, 1994). The emotion slides were all judged to show the designated emotion by 70% or more of the observers in Ekman and Friesen's original study (Ekman & Friesen, 1976). The sadness slides included numbers 2, 8, 15, 23, 36, 43, 49, 58, 67, 75, 76, 77, 86, 87, 94,102, and 103, portrayed by 8 females and 5 males. The anger slides included numbers 3, 10, 18, 25, 30, 38, 44, 52, 53, 61, 62, 69, 80, 89, 96, 105, and 106 portrayed by 8 females and 6 males. The fear slides included numbers 9, 16, 17, 24, 37, 50, 51, 59, 60, 68, 78, 79, 88,

95, and 104, portrayed by 6 females and 5 males. The neutral slides included numbers 6, 13, 21, 28, 33, 41, 47, 56, 65, 72, 83, 92, 99, and 110, portrayed by 8 females and 6 males. In order to be able to create images from these slides on video or in the printed form, each slide was scanned using a Sprint Scan Slide Scanner, manufactured by Polaroid. The scanned slides were converted to computer images and filed in PaintshopPro under the original Ekman and Friesen coding and numbering. A second collection was created on file and all numbers or codes visible on the picture were removed. These pictures were then used to create the visual images for both Study 1 and Study 2.

On hand in the testing room for all studies were two Sony cassette-corders. A Sony cassette-corder TCS 580 contained a blank tape (TDK 90) and a Sony cassette-corder TCM 939 contained a pre-recorded tape (Memorex 60). Eight tapes had been pre-recorded for both Study 1 and Study 2. These tapes were approximately one half hour in length, and were designed for each of the eight possible orders of stimulus conditions utilized in the studies. General information about the experiments was given at the beginning of each tape, followed by detailed instructions for the subjects, practice sessions for both studies, and the two studies themselves. Audible beeps at one second intervals were created on the pre-recorded tape by using the pacer mechanism of a Smart LCD multi-function stopwatch, manufactured by Intertan Inc. (1993).

Record sheets for each study were created so that the experimenter could note the responses. Numbers on the record sheet tallied with the recorded numbers on the tapes for each study and each phase.

3.4 Materials for Study 1

Study 1 was a repeated measures design consisting of two conditions as the within subject variable. In one condition subjects discriminated on the basis of facial emotion and in the other condition subjects discriminated on the basis of facial identity. For both conditions, pairs of faces were created as one picture, each face set adjacent to the other (see Figure 3.1 below). Each pair displayed the faces of either a male or a female. Gender, identity and emotion were counterbalanced. For the Identity condition, two sets of 50 pairs of faces were created. Each face pair consisted of two faces, portraying the same emotion. There were 23 male face pairs and 27 female face pairs. Half of the pairs portrayed two identical faces displaying the same emotion, while the other half portrayed two different faces portraying the same emotion. For the purposes of the later analysis, the former were considered "noise" and the latter "signal". For the Emotion condition, an additional 100 pairs of faces were created. Each face pair consisted of the same face, represented twice. Half of the pairs showed the same face portraying the same emotion, while the other half showed the same face portraying different emotions. For the purposes of later analysis, the former were considered "noise" and the latter "signal". There were 22 male face pairs and 28 female face pairs. Of the "signal" pairs there were 17 face pairs combining sadness and anger, 17 face pairs combining sadness and fear, and 16 face pairs combining anger and fear.

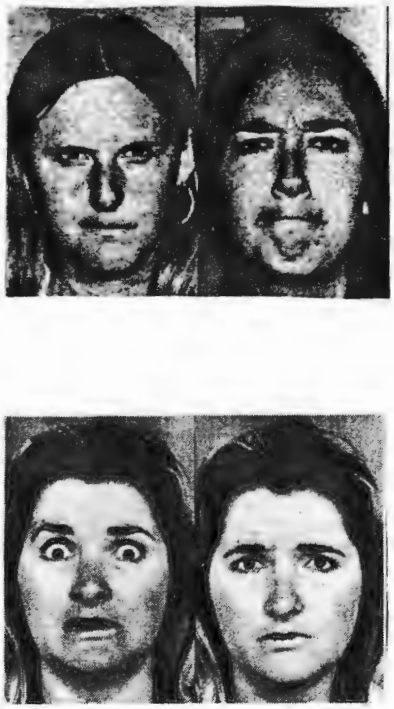

Figure 3.1 The top pair of faces is an example of the pairs of faces shown in Study 1 in the identity condition, where subjects discriminated on the basis of facial identity. The bottom pair of faces is an example of the pairs of faces shown in Study 1 in the emotion condition, where subjects discriminated on the basis of facial emotion.

Once the pairs of faces had been arranged as a computer image, these pairs were printed out onto bond paper. Each face pair image measured 5cm by 4cm. The face pairs were then set in a random order onto a page measuring 21cm by 28cm. There were fifteen pairs of faces on one page, in five rows, three to a row. Each image was numbered from 1 to 100 in each condition with the number centered underneath the face pair. There were six pages with 15 images and one page with ten images for each condition. Each page of slide images was covered by a protective plastic cover and set in a loose-leaf binder. Two practice pages of paired slide images, one for the identity condition and one for the emotion condition were constructed using smaller images measuring 2.5cm by 2cm. There were 25 practice face pairs for each condition, five to a row, with five rows.

3.5 Materials for Study 2

Study 2 was a repeated measures design with time as the within subject variable. In Study 2 subjects viewed 400 slides in total, 200 in each phase or condition. The slides used for Study 2 were identical to those in Study 1, except that single faces portraying sadness, anger, fear or neutrality were used. Whilst the recognition rates of individual slides were judged to show the appropriate emotion by 70% or more of the observers in Ekman and Friesen's normative sample (1976), the average percentage agreements for the 400 slides used in Study 2 were 87% for sadness, 88% for anger and 87% for fear. These faces were subsequently printed out, using the same procedure as in Study 1, to measure 4.5cm by 3cm each. Each image was then set on white bond paper measuring 21cm by 28cm, with 16 faces to a page in four rows of four faces, and protected with a plastic

cover. Each facial image was numbered from 1 to 200 for each phase. Both phases were comprised of equivalent sets of images, with 50 neutral faces, 50 sad faces, 50 angry faces and 50 fearful faces in each condition. The images were arranged randomly, except that the same identity or emotion was not repeated in succession. For the purposes of later analysis the neutral faces were considered "noise" while the sad, angry and fearful faces were considered "signal". Study 2 consisted of two phases, Study 2a and Study 2b. These phases were essentially the same except the stimuli for Study 2b were set in reverse order to the stimuli in Study 2a. In both phases the facial expressions of affect were portrayed by 93 male faces and 107 female faces. Depending on the order to which the subject had been allocated, the phases were pre-recorded onto audio cassettes in one of two ways. One phase was recorded at one second intervals using the beeper mechanism of the Smart LCD stopwatch's pacer function. In other words, there was a one second interval between the numbers assigned to each facial image. The other phase was pre-recorded at three second intervals, so that there was a three second interval between the numbers assigned to each image, although the beeping remained constant at one second intervals throughout.

3.6 Materials for Study 3

Study 3 was a partial replication of a previous study by Parker, Taylor, and Bagby (1993a) and involved the Stroop Task. The original study had three conditions: baseline, neutral and arousal. The present study consisted of four conditions: baseline, neutral, emotional and arousal. Four cards were constructed from white poster board measuring 71cm by 56cm. There were 100 words on each card in 20 rows with five words in each

row. Each word measured 1.2cm high and was printed in capital letters using Crayola non-toxic felt tip pens. The colours used were orange, red, black, blue and green. Each word was arranged randomly and repeated twenty times, four times in each of the five colours. Neither word nor colour was repeated in succession. The baseline and neutral cards followed the format used by Parker et al. The baseline card consisted of five OOOOO's instead of a meaningful word. The neutral card consisted of the words: polite, moderate, clever, typical and fair. The emotion card consisted of the words: anger, surprise, sadness, fear and disgust. The arousal card consisted of the words: torture, mutilation, cancer, assault and murder.

The arousal words in this study differed from those in the original study by Parker et al. (1993a). The Committee for this research proposal considered the word "rape" to be potentially unethical, in that it might evoke an unnecessarily extreme reaction in a subject, especially if they had been raped. In order to create five equivalent words to the original group (rape, vagina, penis, Aids, victim), a pilot study was run prior to the testing period, using UNBC graduate students. These students were presented with 81 words, including the five original arousal words and the five neutral words. Arousal was defined as "a word that evokes in you a state that is different from normal by being distressing or that brings up unpleasant thoughts or feelings". Adjacent to the listed words was a Likert scale of one to five, with 5 indicating greatest arousal and 1 the least arousal. The word "rape" had the highest mean (4.71) and lowest standard deviation (.71). Torture, one of the words chosen for this study, had a lower mean rating (3.79) and a larger standard deviation (1.08). The arousal words chosen for this Study had a higher overall mean

(3.53) than the original words (2.88). The neutral words evoked the least arousal with an overall mean of 1.42.

3.7 Procedure

Subjects were tested at UNBC over a five week period. The experimenter was the same person throughout the testing period. Testing time allotted for each participant was one hour and subjects were tested on an individual basis. For the three studies there were eight possible orders of presentation with Study 1 occurring first in each instance. Study 1 was followed by Study 2, and Study 2 was followed by Study 3. Half the subjects filled out the two questionnaires after completing Study 1, and the other half of the subjects filled out the questionnaires having completed Study 3. There was no time constraint on the filling out of questionnaires. Each subject arrived on the hour, e.g. at 9:00 a.m. Forms for credit were filled out first for 79 of the subjects. The subjects had been told that they would be participating in a one hour experiment on "information processing". Subjects were told that there would be two short questionnaires and three experiments involving visual materials and that these experiments would be timed and fast. They then read and completed the consent form (see Appendix C) which repeated the above information and explained confidentiality and their rights as a subject. Gender and age were noted for each subject at this time. Each subject was assigned a letter and number code. Subjects then sat in a comfortable chair facing a desk. On the desk surface were the file folder containing the stimuli for Studies 1 and 2, and the two Sony cassette-corders. There were eight pre-recorded tapes; one for each of the eight consecutive subject orders, and several blank tapes.

3.8 Procedure for Study 1

Study 1 was administered first to all subjects. Half the subjects received the Identity condition first and half of the subjects received the Emotion condition first, as the within study order. Study 1a represented the Identity condition, whilst Study 1b represented the Emotion condition. The experimenter, who was also the researcher, randomly assigned subjects as they arrived to one of eight orders. Orders 1-4 were essentially the same as orders 5-8 except that subjects assigned to orders 1-4 filled out the two questionnaires having completed all the studies, and subjects assigned to orders 5-8 filled out the two questionnaires after completing Study 1. Given the 146 subjects, these eight orders were rotated 18 times with the final three subjects taking orders 1-3 of the 19th rotation. A record was kept of the order tally and the subject numbers and codes.

The experimenter first turned on the blank tape, explained to the subject that this tape would pick up their responses, together with the recorded numbers and instructions from the other tape. They were told that this recording tape would be wiped clean and reused once all their responses had been correctly entered on the record sheet. Tape counters were set at zero for each cassette-corder. Next the experimenter recorded the date, order number and subject number on the recording tape and switched on the pre-recorded tape. Subjects were instructed to listen to the pre-recorded tape and follow the recorded instructions. The initial spoken recorded instructions repeated the information regarding the two questionnaires and the three studies, and explained about the differing order of presentations. Subjects were asked to sit comfortably and listen to the numbers being called out and to answer loudly enough for the second cassette-corder to pick up

their voice clearly. Subjects were instructed to say "Yes" if they perceived a difference between the faces in each face pair and to keep silent if they perceived no difference. They were told that Study 1 involved speed and not to worry if they missed responses, just to keep on going and to relax. They were to ask before each testing if there was anything they did not understand since tests could only be run once. It was explained to the subjects that they would view 200 slides in Study 1; 100 in phase 1, 100 in phase 2. They would see two faces at the same time and they should indicate by saying "yes" if the faces seemed different in any way, and remain silent if they judged the faces to be the same. The faces could be different in a number of ways but the experimenter would not specifically indicate the difference. They were to make a judgement and respond within the given time limit. They were to shift attention to the next slide, only when they heard the appropriate number. The face pair numbers were read simultaneously with the one second beeps on the recorded tape. In other words, the numbers were recorded at one second intervals, apart from those instances where the page needed turning.

Listening to the pre-recorded instructions, subjects were instructed to turn to the front of the file folder and find the first and second practice pages for studies 1a and 1b. On both practice pages subjects viewed 25 face pairs. Subjects were told to respond by saying "yes" if, and only if, the faces seemed different in any way. If they perceived no difference they were to remain silent. If they felt that they needed more practice, this option was open to them, although no subjects took advantage of this option. Each face pair in the study was numbered from 1 to 25 for the two practice pages, and from 1 to 100 for both Study 1a and 1b. At the end of each page of 15 face pairs in Study 1, subjects

were asked to "please turn the page". This process continued throughout the first phase, followed by the second phase. The experimenter was careful to check at the beginning of each testing that each subject was looking at the correct set of slides, i.e. the phase order to which they had been assigned, Study 1a or 1b. The experimenter sat behind the subject, close enough to hear the responses but unable to see which slides were being viewed. The experimenter recorded by pencil line a "yes" response for each numbered face pair on the printed record sheets, leaving the silent numbers blank. If the initial response was unclear to the experimenter or missed, the experimenter listened to the recording tape later that day to verify the responses. Tapes were wiped clean after this process.

3.9 Procedure for Study 2

There were four possible within study orders for Study 2. Subjects allocated to the first and fifth order, viewed the first phase (Study 2a) first at intervals of one second. Subjects allocated to the second and sixth order, viewed the first phase (Study 2a) first at intervals of three seconds. Subjects allocated to the third and seventh order viewed the second phase (Study 2b) first at intervals of three seconds. Lastly, subjects allocated to the fourth and eighth order viewed the second phase (Study 2b) first at intervals of one second.

At the commencement of Study 2, subjects had either just completed Study 1, or had completed Study 1 followed by completion of the TAS-20 and PANAS questionnaires. Listening to the pre-recorded instructions, subjects were instructed to turn to the front of the file folder and find the third and fourth practice pages for Studies

2a and 2b. On both practice pages subjects viewed 25 single faces measuring 2.5cm by 1.5cm each. Subjects were told to repond by saying "yes" if, and only if, they perceived an emotion. If the face appeared to be emotionless, they were to remain silent. Each face in the study was numbered from 1 to 25 for the practice pages, and from 1 to 200 for Study 2a and 2b. Presentation of both phases in Study 2 was essentially the same except that one was presented more quickly (one second intervals) than the other (three second intervals). Subjects were again instructed to shift attention to the following facial image only after hearing the appropriate number. If they missed a response they were to relax but to keep on going. After the sixteenth image on each page, they were instructed; "please turn the page" and the process resumed until all 200 facial images had been viewed for each phase. The experimenter followed the procedure already outlined under general procedure.

3.10 Procedure for Study 3

Study 3 followed Study 2. The recording tape was left running, but the pre-recorded tape was switched off at this point. Subjects turned round to face the experimenter. The experimenter, blind to the subjects' TAS-20 and PANAS scores, balanced the poster board so that it faced the subject. There were four possible orders for the Stroop Study, and subjects were randomly assigned to one of the four orders. This presentation order differed from the original study by Parker et al. (1993a), in that they had presented the Stroop cards in a fixed order. The present Stroop orders, where 1=baseline, 2=neutral, 3=emotional and 4=arousal were: first Stroop order = 1,2,3,4, second Stroop order = 4,3,2,1, third Stroop order = 3,4,1,2, and the fourth Stroop order

= 2,1,4,3. Subjects were instructed by the experimenter to name the colour each word was written in, from left to right, top to bottom. They were asked to ignore the meaning of the text, and just to say the colour the word was written in, as fast and as accurately as possible. Although subjects had been screened for colour blindness, each subject was asked to identify and name out loud the five colours prior to the Stroop Task. To make sure that the subjects had understood the instructions, they were asked the question: "If you saw the word 'experience' written in red, what would you say? (Red). Using the Smart LCD stopwatch, the experimenter timed the subjects' total time taken to colour name each Stroop card in hundredths of seconds.

After the task was completed subjects were invited to describe how they felt about the words, and which words, if any, they remembered. These were recorded. It had been noted by the experimenter that some subjects tended to laugh easily whilst doing the Stroop Task, some appeared unaffected, and some seemed tense.

3.11 Debriefing

After completion of the Studies and questionnaires, subjects were asked if they had any questions or concerns. They were asked to avoid discussion of the experiments because of the nature of Study 1, but general questions about the nature of these studies could be addressed at this stage on an individual basis. They were also advised that the Stroop Task could be stressful, and the theory underlying the Stroop Task was explained to the subjects.

CHAPTER 4

Results

4.1 Questionnaires

All statistical results were computed using SPSS 6.1 for Windows. After completion of the data entry, an error rate was calculated for the data set for Studies 1, 2, 3, and the questionnaires. Data for 15 subjects, more than ten percent of the total number of subjects, were checked and one error found which resulted in a projected error rate of .000098 for the entire study.

Since alexithymia appears to be a dimensional rather than a categorical construct (Taylor, 1994), descriptive statistics for the TAS-20 were used to distinguish among low, moderate and high alexithymia groups. Subjects were identified as low, medium or high alexithymic on the basis of their TAS-20 scores, using the 33rd and 66th percentiles to distinguish among the three groups. The 33rd percentile had a value of 42 and the 66th percentile had a value of 50. The low alexithymia group was made up of 49 subjects with a mean score of 35.14, and a standard deviation of 4.75. The medium alexithymia group was made up of 53 subjects with a mean score of 46.77 and a standard deviation of 2.33. The high alexithymia group was made up of 44 subjects with a mean score of 57.41 and a standard deviation of 5.32. The earlier pilot study (Parker & Prkachin, 1995) comprising 77 UNBC students had a minimum score of 31 and a maximum score of 69, with a mean of 47 and a standard deviation of 9.38. Thus, the present sample resembled that in the previous sample and, in fact, appears quite comparable to the university sample of Bagby,

Parker, and Taylor (1994). Descriptive statistics for the TAS and PANAS scales are shown in Table 4.1.

Table 4.1

Descriptive Statistics for the TAS-20 and PANAS Scales

SCORES	minimum	maximum	mean	s.d.
TAS	24	71	46.08	9.87
DIF	7	29	16.25	5.12
DIDF	5	23	12.34	4.08
EOT	8	28	17.48	4.10
PA	19	48	34.96	5.68
NA	11	41	20.30	5.82

Note. TAS refers to the Toronto Alexithymia Scale-20; DIF refers to Factor I or Difficulty in Identifying Feelings; DIDF refers to Factor II or Difficulty in Describing Feelings; EOT refers to Factor III or Externally Oriented Thinking; PA refers to Positive Affect; NA refers to Negative Affect.

The PANAS scores were identified as either negative affectivity (NA) or positive affectivity (PA). Subjects were identified as either high or low NA or PA on the basis of a median split in either scale. The median for the NA scale was 19, while the median for the PA scale was 35. In order to maintain a reasonable balance within cells given the limited sample size, the median for NA was taken as 18, rather than 19. Seventy subjects with scores equal to or less than 18 were identified as low NA with a mean score of 15.59, and a standard deviation of 9.92. Seventy-six subjects with scores equal to or more than 19 were identified as high NA, with a mean score of 24.64 and a standard deviation of 4.71. Seventy-five subjects with scores equal to or less than 35 were identified as low PA with a mean score of 30.47 and a standard deviation of 3.71. Seventy-one subjects with scores equal to or more than 36 were identified as high PA with a mean score of 39.70 and a standard deviation of 2.78.

Whilst 32 percent of the entire TAS-20 population were male, 27 percent of the low alexithymic group were male, 36 percent of the medium alexithymic group were male and 32 percent of the high alexithymic group were male. Crosstabulation of the NA and TAS groups revealed that low TAS and low NA shared 38 subjects or 78 percent of the low TAS group. High TAS and high NA shared 32 subjects, or 73 percent of the high TAS group. Low TAS and high NA shared 11 subjects or 22 percent of the low TAS group, while high TAS and low NA shared 12 subjects or 27 percent of the high TAS group. High TAS and high PA shared 7 subjects or 16 percent of the high TAS group.

The intercorrelations among the measures are shown in Table 4.2:

Table 4.2

Intercorrelations among the TAS-20 and PANAS Measures

	DIF	DIDF	EOT	NA	PA	TAS
DIF						
DIDF	.5391					
	p=.000					
EOT	.0819	.3511				
	p=.326	p=.000				
NA	.5634	.3644	.1745			
	p=.000	p=.000	p=.035			
PA	-.4498	-.4297	-.3080	-.4053		
	p=.000	p=.000	p=.000	p=.000		
TAS	.7755	.8390	.6035	.5154	-.5390	
	p=.000	p=.000	p=.000	p=.000	p=.000	

Note. DIF refers to Factor 1 or Difficulty in Identifying Feelings; DIDF refers to Factor 2 or Difficulty in Describing Feelings; EOT refers to Factor 3 or Externally Oriented Thinking; NA refers to Negative Affect; PA refers to Positive Affect; TAS refers to the Toronto Alexithymia Scale-20.

4.2 Study 1

Following the tradition of Pollack and Norman (1964), a non-parametric index of sensitivity, the average of all possible maximum and minimum areas under the Receiver-Operating-Characteristic curve defined by the subject's performance, or A prime (A'), was calculated using the following formula: $A' = .5 + ((y-x)(1+y-x))/4y((1-x))$, where y equals the probability of hits and x equals the probability of false alarms (Grier, 1971). A hit was defined as saying a signal was there when it really was there, and a false alarm as saying a signal was there when it was not. In this study the number of hits was greater than the number of false alarms in all cases and therefore it was possible to use this formula.

Before running the split plot ANOVAs, a 2 x 2 repeated measures ANOVA was run as a preliminary analysis with gender as the between subject variable and task (identity or emotion discrimination) as the within subject variable. There was no significant main effect of gender $F(1,144)=.65$, $p=.421$, nor was there a statistically significant gender by task interaction $F(1,144)=.85$, $p=.359$. Since all questionnaires were administered after completion of Study 1, their order was not considered relevant to the analysis. Consequently, gender and order of questionnaires were omitted from further analyses in Study 1.

The ultimate repeated measures ANOVA was then a 3 (alexithymia groups) x 2 (NA groups) x 2 (order of phases) by 2 (task: identity versus emotion discrimination), with the latter factor involving a repeated measure. There was a main effect of task, $F(1,134) = 20.32$, $p = .001$, with the mean A' for the identity discrimination (.94) exceeding the mean A' for the emotion discrimination (.90). There was also a statistically significant phase

order by task interaction $F(1,134) = 4.71$, $p = .032$. Means for the phase order by task interaction are shown in Table 4.3 below. For both the identity and the emotion condition, the means were higher in phase order 1. In other words, if the identity condition was presented first, the means for that task were higher than those presented after the emotion condition. If the emotion condition was presented first, the means for that task were higher than those presented after the identity condition.

Table 4.3

Means for the Phase Order and Task Interaction in Study 1

	PHASE ORDER 1		PHASE ORDER 2	
	M	SD	M	SD
IDENTITY	.95	.05	.94	.06
EMOTION	.91	.09	.89	.11

Note. Phase order 1 is the phase in which the task was presented first; Phase order 2 is the phase in which the task is presented second.

4.3 Study 2

Study 2 was a between-within experimental design, with TAS and NA groups, order of phases and order of time as the between subject variables, and task (recognition of emotion) as the repeated measures factor. A' values were calculated from the probabilities of hits and false alarms for emotion conditions at the one second and the three second level. In a later analysis A' values were also calculated from the probabilities of hits and false alarms for each separate emotion condition at the one and

three second level. A hit was defined as saying an emotion was there when it really was, and a false alarm as saying an emotion was there when it was not.

Before running the split plot ANOVAs a 2 (order of questionnaires) x 2 (gender) x 2 (task) repeated measures ANOVA was run as a preliminary analysis. There were no significant main effects for gender $F(1,142) = .34$, $p = .561$, for order of questionnaires $F(1,142) = 1.05$, $p = .308$, or for an order of questionnaires by gender interaction $F(1,142) = .25$, $p = .619$. Consequently, gender and order of presentation of the questionnaires were omitted from further analysis in Study 2. The next repeated measures ANOVA was a 3 (TAS groups) x 2 (NA groups) x 2 (phase order) x 2 (order of time) x 2 (task) with the latter factor involving a repeated measure. Tests involving between subjects effects showed a statistically significant main effect for the TAS groups $F(2,122) = 3.70$, $p = .028$. Means are presented in Table 4.4 below.

Table 4.4

Alexithymia Group Means for Emotion Recognition at the One and Three Second Levels

MEANS	ONE SECOND		THREE SECONDS	
	M	SD	M	SD
Low Alexithymia	.94	.03	.96	.03
Mod. Alexithymia	.92	.05	.95	.04
High Alexithymia	.91	.04	.96	.03

Note. Low Alexithymia refers to the low alexithymic group; Mod. Alexithymia refers to the moderate alexithymic group; High Alexithymia refers to the high alexithymic group

A Tukey's HSD post hoc test (Kirk, 1995) revealed a significant difference between the high and low alexithymic groups in the one second time condition. There was no significant main effect for the NA groups $F(1,122) = .01$, $p = .922$. Tests involving within subject effects revealed a statistically significant main effect of task $F(1,122) = 85.60$, $p = .001$. The mean for the three second condition (.96) exceeded the mean (.92) for the one second condition. There was no significant TAS group by task interaction $F(2,122) = 1.75$, $p = .178$, nor was there a significant NA group by task interaction $F(1,122) = .28$, $p = .595$.

TAS tercile groups for each TAS factor were substituted for the TAS groups for the next three repeated measures ANOVAs. These ANOVAs were 3 (Factor groups) x 2 (NA groups) x 2 (phase order) x 2 (order of time) x 2 (task) with the latter factor involving a repeated measure. There was no significant main effect for either Factor I (Difficulty in Identifying Feelings) $F(2,122) = .21$, $p = .814$, or for Factor III (Externally Oriented Thinking) $F(2,122) = .41$, $p = .661$. There was a statistically significant main effect for Factor II (Difficulty in Describing Feelings) $F(2,122) = 4.07$, $p = .019$. Tests involving within subject effects revealed a statistically significant Factor II by task interaction $F(2,122) = 4.02$, $p = .020$. Figure 4.1 below shows the interaction of Factor II (Difficulty in Describing Feelings) with the task (emotion recognition at the one and three second levels).

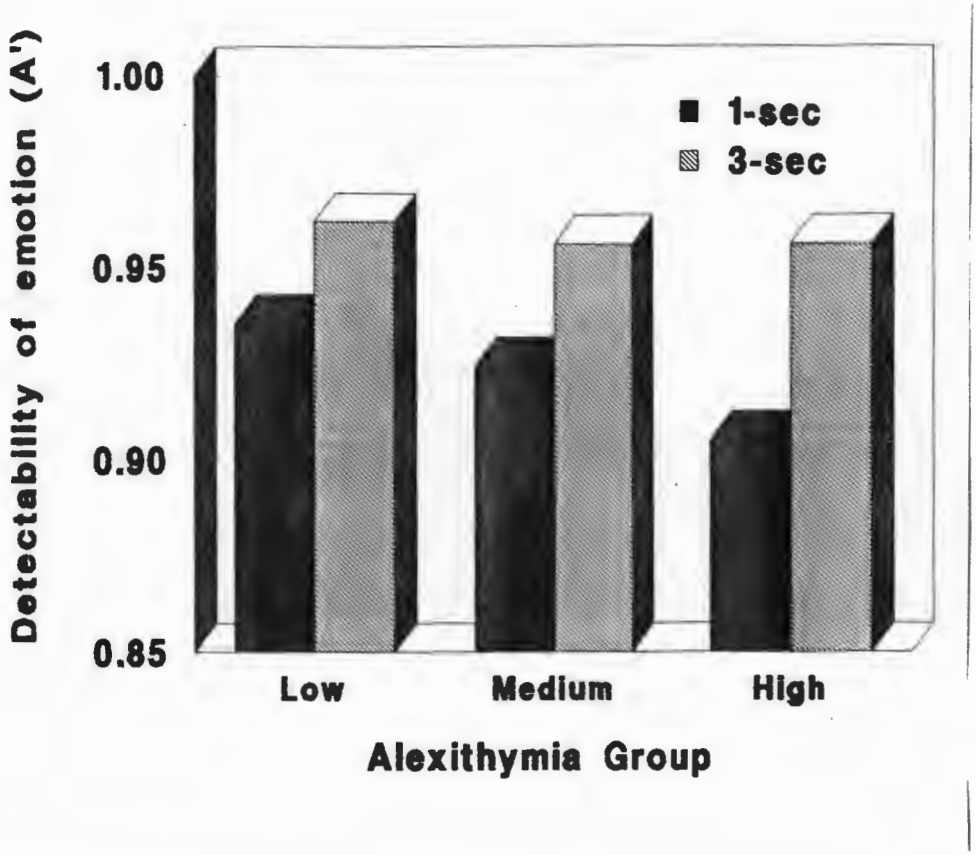

Figure 4.1 Interaction of Factor II (Difficulty in Describing Feelings) tercile groups with the task (recognition of emotion) at one and three second intervals in Study 2.

A Tukey's HSD post hoc (Kirk, 1995) revealed a significant difference between the low and high Factor II group means and between the moderate and high Factor II group means in the one second condition. Group means for the three second condition were not significantly different from one another. Table 4.5 below shows the means for the interaction of Factor II and the task.

Table 4.5

Means for the Interaction of Factor 2 Groups (Difficulty in Describing Feelings) with the Task of Recognizing Emotions at the One and the Three Second Levels.

MEANS	ONE SECOND		THREE SECONDS	
	M	SD	M	SD
DIDF 1	.94	.04	.96	.03
DIDF 2	.92	.04	.96	.03
DIDF 3	.91	.05	.96	.03

Note. DIDF 1 refers to low Difficulty in Describing Feelings; DIDF 2 refers to moderate Difficulty in Describing Feelings; DIDF 3 refers to high Difficulty in Describing Feelings.

To further analyze the sources of these differences, a series of ANOVAs was conducted to investigate subjects' abilities to recognize the individual emotions. The ANOVA designs were 3 (TAS groups) x 2 (NA groups) x 3 (emotions) x 2 (time) with repeated measures on the latter two factors. Since neither the phase order nor the order of time was statistically significant in the previous analyses, these between subject variables were omitted from further analysis. For the between subject effects there was a

statistically significant main effect of TAS groups $F(2,140) = 3.54$, $p = .032$. There was no significant main effect for the NA groups $F(1,140) = .01$, $p = .935$, nor was there a significant TAS by NA group interaction $F(2,140) = .37$, $p = .692$. Tests involving the emotion within subject effects showed a statistically significant main effect of emotion $F(2,280) = 171.22$, $p = .001$, but no statistically significant TAS group by emotion interaction $F(4,280)=1.10$, $p = .358$, and no significant NA group by emotion interaction $F(2,280)=.53$, $p = .589$. A Tukey's HSD Post Hoc test (Kirk, 1995) showed that the combined mean for sadness (.92) was significantly different from the combined mean for anger (.95), and that the combined mean for anger was significantly different from combined mean for fear (.96). Tests involving time within subject effects showed a statistically significant main effect for time $F(1,140) = 101.33$, $p = .001$ with the means for the 3 second condition (.96) exceeding those of the one second condition (.92). Tests involving emotion by time within subject effects showed a statistically significant emotion by time interaction $F(2,280) = 27.84$, $p = .001$ (see Figure 4.2 below). Post Hoc tests showed there to be a significant difference between means for sadness at the one (.89) and at the three (.94) second intervals. Neither anger nor fear had statistically significantly different means in the one and three second conditions, although the means for anger at the one (.93) and at the three (.96) second intervals were close to being significantly different.

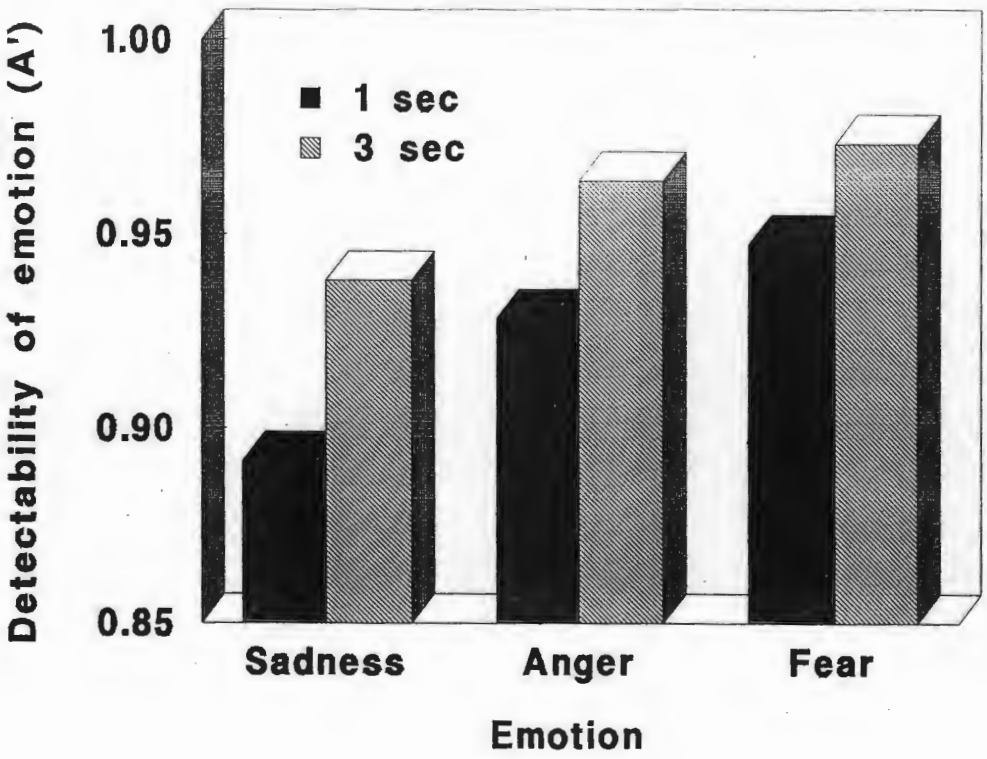

Figure 4.2 Differences in means for the separate emotions at the one and the three second intervals for the combined alexithymia groups in Study 2.

The individual emotion analyses were repeated using the TAS-20 factors to discriminate among groups. In the analysis using Factor II (Difficulty in Describing Feelings) there was a statistically significant Factor II by time interaction, $F(2,140) = 4.21$, $p = .017$ (see Figure 4.1). Tests involving Factor I (Difficulty in Identifying Feelings) showed a statistically significant Factor I by emotion by time interaction $F(4,280) = 3.66$, $p = .006$. A Tukey's HSD Post Hoc test (Kirk, 1995) revealed a significant difference in means for the recognition of sadness between the high (.88) and the low (.90) Factor I groups in the one second condition (see Figure 4.3).

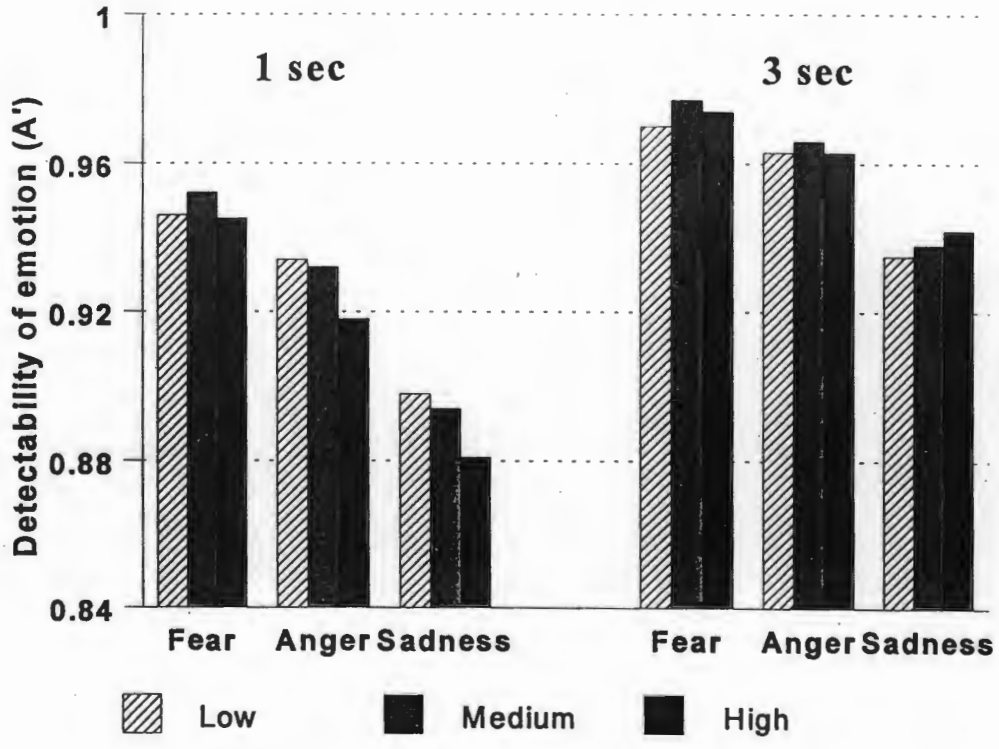

Figure 4.3 Factor I (Difficulty in Identifying Emotions) group means for the recognition of sadness, anger, and fear, at the one and the three second intervals in Study 2.

4.4 Study 3

Study 3 was a between-within experimental design with the TAS tercile groups, the NA median split groups, and the order of presentation of the task as the between subject variables, and the task (colour naming words) as the within subject repeated measure. A preliminary repeated measures analysis was a 2 (order of questionnaires) x 2 (gender) x 4 (task). In the tests involving between subject variables there was no statistically significant main effect of order of questionnaires $F(1,142) = .45$, $p = .502$, no statistically significant main effect of gender $F(1,142) = 1.89$, $p = .171$, and no statistically significant order of questionnaires by gender interaction $F(1,142), = .55$, $p = .460$. Consequently, these factors were not considered in the main analysis which was a 3 (TAS groups) x 2 (NA groups) x 4 (order of presentation) x 4 (task) ANOVA, with the latter factor involving a repeated measure. Tests involving within subject effects showed a statistically significant main effect for task $F(3,366) = 87.20$, $p = .001$. A Tukey's HSD post hoc test showed that the baseline condition means were significantly different from the neutral condition, the emotion condition, and the arousal condition means. The arousal condition means were significantly different from the emotion condition means, while the emotion and neutral conditions were not significantly different from one another (See Table 4.6 below).

Table 4.6

Means for the TAS-20 Population in each of the Four Stroop Task Conditions

CONDTIONS	BASELINE	NEUTRAL	EMOTION	AROUSAL
MEANS	68.86	78.58	78.99	80.82
SD	11.92	13.49	14.95	14.71

There was a statistically significant order of presentation by task interaction $F(9,366) = 6.24$, $p = .001$ (see Table 4.7 below).

Table 4.7

Means for the Stroop Task in the Baseline, Neutral, Emotion and Arousal Conditions in each of the Four Orders of Presentation

MEANS	BASELINE		NEUTRAL		EMOTION		AROUSAL	
	M	SD	M	SD	M	SD	M	SD
ORDER 1	68.53	(11.00)	78.75	(11.70)	79.78	(13.22)	84.18	(13.98)
ORDER 2	69.47	(12.37)	81.14	(16.13)	80.17	(16.56)	77.43	(14.43)
ORDER 3	70.08	(13.58)	79.95	(13.20)	75.95	(12.60)	80.70	(14.03)
ORDER 4	67.37	(10.85)	74.42	(12.02)	79.99	(17.11)	80.98	(16.15)

Note. Order 1 = baseline, neutral, emotional, arousal. Order 2 = arousal, emotional, neutral, baseline. Order 3 = emotional, arousal, baseline, neutral. Order 4 = neutral, baseline, arousal, emotional.

Since this was a partial replication of a previous study (Parker, Taylor, & Bagby, 1993a), there was another repeated measures ANOVA using cutoff scores for the low (scores less than or equal to 51), medium (scores ranging from 52 to 60) and high (scores greater than 60) alexithymia groups that were used by Parker et al. (1993a). There was neither a statistically significant main effect of TAS groups $F(2,125) = .37$, $p = .690$, nor was there a statistically significant alexithymia by task interaction $F(6,375) = .81$, $p = .566$, in this 3 x 2 x 4 x 4 repeated measures ANOVA.

CHAPTER 5

Discussion

The underlying purpose of these three studies was to examine the relationship between alexithymia and the processing of emotional stimuli. It was hypothesized that alexithymics' ability to detect visual stimuli would be normal, but that their ability to then attend to or integrate affective-cognitive information might be impaired.

In Study 1 selective attention to identity versus emotion stimuli under temporal constraint was examined. It was expected that alexithymics would respond less accurately than non-alexithymics when perceiving differences in emotion stimuli, but that alexithymics and non-alexithymics would respond similarly when perceiving differences in identity stimuli.

In Study 2 recognition of facial expressions of emotion versus neutral expressions was examined in two timed conditions. It was expected that alexithymics would respond less accurately than non-alexithymics to facial expressions of emotion given temporal constraint, but that they would respond similarly to non-alexithymics in the slower condition.

In Study 3 the overall response time to verbal expressions of emotion and arousal versus neutral and baseline words was examined in a Stroop Task. It was expected that alexithymics would respond more slowly than non-alexithymics in the emotion and arousal conditions, but that they would respond similarly to non-alexithymics in the baseline and neutral conditions.

In all three studies it was hypothesized that higher levels of alexithymia would be associated with less accurate and slower response times to negative emotional stimuli, but that higher levels of alexithymia would result in no difference in accuracy or response time to non-emotional stimuli. It was also hypothesized that alexithymia and negative affectivity, although clearly associated, are demonstrably separate constructs. It was hoped that the results of these studies would help disentangle the two.

5.1 Study 1

In Study 1 all subjects responded less accurately to emotion stimuli than to identity stimuli. There were no significant differences among the three alexithymic groups, although the low alexithymic group responded more accurately than the moderate group, who in turn responded more accurately than the high alexithymic group. There was no significant difference between the NA groups, although the low NA group responded more accurately than the high NA group. The fact that no significant differences were found among the alexithymic groups may be due to the specific question posed in the experiment. In Study 1 subjects were in fact required to compare faces and to say whether the two faces presented were the same or different. Study 1 therefore measured the ability to compare faces and perceive a difference, rather than the ability to say whether an emotion was present or not. Having to compare faces may involve less complex processing, and different neural systems, than having to discriminate among emotions, or having to recognize emotions. Discrimination may imply that some kind of implicit labelling is required in order to differentiate between emotions: Recognition of emotions may involve similar processes. Discrimination and recognition of facial

expressions of emotion also imply a knowledge of emotion. Comparison of faces in the emotion condition may involve more processing than comparing faces in the identity condition, but less processing than for the recognition of emotion. Being able to discriminate among emotions may involve more complex processing than comparing faces, or perceiving a difference between faces. The results show a trend for alexithymic groups to be similar in the identity condition, but increasingly, though not significantly, less accurate in the emotion condition. The objective of Study 1 was to see whether alexithymics attended to identity rather than emotion, by hypothesizing that the high alexithymic group would be less accurate in the emotion condition. It appears that all subjects attended more accurately to facial expressions of identity than to facial expressions of emotion given temporal constraint.

The results of Study 1 seem to imply separate processes for the recognition of expressions of identity and emotion. They may imply fewer synapses or less complex processing for the task of perceiving differences, whatever those differences may be. The overall difference in accuracy between the two conditions, identity and emotion, suggests both a qualitative and quantitative difference in the way that we attend to and process the recognition of facial identity from the way we attend to and process the recognition of facial expressions of emotion. It suggests that, given temporal constraint, we are better able to attend to, and process stimulus features of facial identity, and that we process them more accurately and hence more quickly than we process stimulus features of facial expressions of emotion.

Finding a difference in accuracy whilst perceiving emotion versus identity stimuli is consistent with the evidence suggesting that facial identity and facial expression are processed separately (George et al., 1993; Humphreys, Donnelly, & Riddoch, 1993; Magnussen, Sunde, & Dyrnes, 1994; Prkachin & Prkachin, 1994; Young, 1992). However, while the findings of Study 1 are consistent with the concept of separate mechanisms for the processing of facial expression and facial identity, they are not entirely consistent with prior research suggesting a generalized or shared processing for identity and expression (Braun, Denault, Cohen, & Rouleau, 1994; Endo, Endo, Kirita, & Maruyama, 1992). The findings of Study 1 may lend support for the idea that facial identity and facial expression of emotion share common neural mechanisms for processing, but may diverge for higher order processing (George et al., 1993; Weddell, 1989).

The increased accuracy in the identity condition may suggest fewer synapses in identity processing, since the information appears to be transmitted faster. Several subjects were unable to respond with any accuracy to the emotion condition. This was not true for the identity condition. The fact that more subjects had difficulty with the emotion condition when required to shift from one condition to the other, suggests that processing of facial expression overlaps with, and perhaps builds upon, the processing of facial identity. It may suggest that people are pre-disposed to attend to features of identity. Future research is needed to disentangle these two processes. In Study 1 subjects were required to respond within a one second time interval. It would be interesting to see whether there is any difference in accuracy between the two conditions if subjects are asked to respond within a slower time interval. It may be important to see

what happens if the exposure duration is manipulated in both directions; i.e. either faster or slower.

The fact that each condition was perceived more accurately when presented first may suggest that priming plays a role in attention mechanisms and possibly affects our ability to shift to, disengage from or neglect stimuli. It may equally well suggest that fatigue contributes to less accurate responses. The fact that both the identity and emotion conditions were affected to the same degree by order presentation may lend support for the speculation that both abilities do share common pathways at some stage in the processing of information.

In summary, Study 1 was intended to shed some light on the role of alexithymia in selective attention processing. The hypothesis that alexithymics would attend to identity stimuli rather than to emotion stimuli was not confirmed. On the whole, all subjects appeared to process facial expressions of identity more accurately than they did facial expressions of emotion. These results suggest that, while processing for facial expressions of identity and facial expressions of emotion may share common pathways, there are also differences in the processing required for these two types of stimuli. The results also imply that alexithymia is not a significant factor in the attention stage of information processing.

5.2 Study 2

The results of Study 2 were consistent with the expectation that alexithymics would be less accurate than non-alexithymics in the recognition of emotional stimuli given temporal constraint, and that higher levels of alexithymia would result in less accurate

responses. For the purposes of this study, the term 'recognition' was used to imply an ability to both detect, and elaborate on, emotional stimuli. Having to perceive emotional stimuli within a one second time frame resulted in an overall lower accuracy for all subjects. However, there was a significant difference between the alexithymic groups. The least accurate responders were the high alexithymic group, and the most accurate responders were the low alexithymic group. Responses to emotional stimuli within the three second time frame were not significantly different for the three alexithymic groups. This difference in accuracy between the one and three second time frame suggests that the one second interval was perceived as a constraint by all subjects and placed additional demands on the emotion processing of the high alexithymic group.

These results suggest that time is an important factor in emotion processing for all subjects. The fact that high alexithymics recognize the presence of emotional information similarly to the low and moderate groups given sufficient time, suggests that, in a normal situation, they are able to detect, attend to and recognize facial expressions of emotion. This is consistent with the previous suggestions that alexithymics were able to accurately identify facial expressions of emotion, and pose facial emotions similarly to non-alexithymics (McDonald & Prkachin, 1990). Alexithymics are able to recognize emotion, but appear to be impaired when faced with excessive demands, such as temporal constraint. Since high alexithymics appear to behave similarly to low alexithymics in the slower condition, the results also suggest that alexithymics have a functional rather than a structural deficit in emotion recognition since the differences between groups were only apparent in the temporal constraint condition. This assumption needs further testing.

The fact that high alexithymics were less accurate in perceiving emotion given temporal constraint lends support to the suggestion that, in a situation in which they experience excessive demands such as temporal constraint, they may process negative emotion stimuli differently to the way in which low or moderate alexithymics process the same information. The fact that high alexithymics were less accurate in perceiving emotion within the one second time frame seems to imply that they 'fast track' information when faced with excessive demands, and that this method of processing sensory or emotional information leaves them at a disadvantage as to the precise nature of the stimulus. The term 'fast-tracking' is somewhat confusing, since it implies that the processing of information is quicker than normal or multimodal processing. 'Fast-tracking' implies that information about a stimulus is processed more quickly, but also more crudely, given temporal constraint. When a person is faced with excessive demands, that person may process certain stimuli as if the stimuli were threatening, or as if the situation demanded that the information should be processed more quickly than normal. The benefits of 'fast-tracking' are that the person may be able to react appropriately and instantaneously to the stressor. The disadvantage of 'fast-tracking' is that the person does not consciously know details about the stimulus. This processing by-passes, as it were, the contextual and identity features of the stimulus.

It has been suggested that alexithymics may have a deficit in the spontaneous encoding of negative emotions (McDonald & Prkachin, 1990). Alexithymics are reported to have higher tonic arousal than normal subjects (Wehmer, Brejnak, Lumley & Stettner, 1995) and this higher baseline state may predispose them to 'fast-tracking'. Their

impairment in recognizing the presence of emotion appears to be contingent on the perception of threat, or distress, or on challenging the perceptual processing systems' capacities in some other way involving time. In this study, this challenge, or the perception of threat or distress, was prompted by the condition of temporal constraint. Again, this seems consistent with the previous finding that alexithymics were only impaired in spontaneous displays of negative emotion (McDonald & Prkachin, 1990).

5.3 Study 2 and the TAS-20 Factors

Prior to the three studies, the hypotheses had been limited to assuming that the three factors contributing to the construct of alexithymia; Factor I or Difficulty in Identifying Feelings, Factor II or Difficulty in Describing Feelings and Factor III or Externally Oriented Thinking, would be of equal significance. Previous researchers, however, had implied that, depending on the area of research under investigation, certain factors contributing to the construct appear to be more closely aligned (Berenbaum & James, 1994; Berenbaum & Prince, 1994; Prince & Berenbaum, 1993; Rubino, 1995). Cross validation of the factor structure suggesting that Factors I and II correlate and Factors II and III correlate (Bagby, Parker, & Taylor, 1994) seems to be replicated by the interfactorial correlations in these studies (see Table 4.2). The results from Study 2 suggest that Factor II, or Difficulty in Describing Feelings, plays more of a role in the ability to recognize emotional stimuli when under time constraint, than the other two factors; the greater the difficulty in describing emotions, the greater the impairment in recognizing emotions given temporal constraint (see Figure 4.1).

TAS-20 items contributing to Factor II are comprised of questions which indicate the extent to which the person has words for feelings or is able to articulate those feelings to others (see Appendix A). The questions measure difficulty in finding the 'right words' for feelings, and the ability to both describe or reveal feelings to others. Subjects belonging to the group that had the most difficulty in describing feelings were significantly less accurate in recognizing emotional stimuli in the one second time frame, but were similar to the low and moderate groups in the three second time interval (see Figure 4.1). Neither Factor I, Difficulty in Identifying Feelings, nor Factor III, Externally Oriented Thinking, appeared to have any significant effect on the ability to recognize emotion stimuli under time constraint when considering the combined emotions. It would appear that, although Factor II or Difficulty in Describing Feelings is moderately correlated with the other two TAS-20 factors, it is distinctly different from them in its ability to impair accuracy in recognizing emotions given temporal constraint. These results are consistent with recent findings suggesting that Factor II is associated with an impairment in the recognition of verbal and non-verbal emotional stimuli (Lane et al., 1996). For future research it might, therefore, be important to investigate the neural mechanisms implicated in these three factors in order to pinpoint the neural structures which are specific to Factor II, and which are not shared by the other two factors.

5.4 Study 3

Study 3 was a partial replication of a previous study using the Stroop Task (Parker, Taylor, & Bagby, 1993a) with the addition of an emotion condition. The original study had three conditions: baseline, neutral and arousal. In this study an emotion condition

was added, thus yielding four conditions: baseline, neutral, emotion and arousal. In spite of the fact that the subjects in this study appeared to be similarly distributed on the alexithymia continuum as in the Parker et al. study, their results were not replicated, even when using the same cut off scores for the high and low alexithymia groups that were used in their study. This difference may reflect other methodological differences between the studies. While Parker et al. chose to present the Stroop tasks in a fixed order, the Stroop tasks in this study were presented randomly and there was a significant order effect, with each condition having the quickest response time when presented first. Their rationale for using a fixed order was based on a study of suicide attempters (Williams & Broadbent, 1986) where it was found that using a fixed order or random order made no difference to the outcome or results. However, the important comparison in that study was between response times for general negative words as opposed to specific negative words. Only general negative words were used in this study.

In addition to the difference in order presentation, there was also a difference in words chosen for the arousal condition. The words selected by Parker et al. (1993a) had been used previously as high threat stimuli for rape victims, who experienced greater cognitive interference than the control subjects in this task. The words in this study were chosen for their general distressing effect as opposed to the specific distressing effect of the words chosen by Parker et al. This difference in words may also contribute to the lack of between group differences in colour naming interference. Rape is often associated with PTSD, which is also associated with secondary effects that resemble alexithymia. We do not know whether the high scores of the alexithymic group used by Parker et al.

were due to primary or secondary alexithymia. If there were subjects in their high alexithymic group with secondary alexithymia associated with sexual trauma, it would explain how the specific words used in their study incurred significant group differences. The word 'rape' had the highest overall arousal effect when tested in the pilot study administered prior to Study 3. Of the 81 words used in the pilot study, 'rape' clearly had the highest mean score for all subjects, suggesting that there is something specific about the word 'rape', which is distressing for both male and female subjects. The arousal effect of the other words used by Parker et al., e.g. 'penis, vagina, Aids and victim', may have been compounded when seen in conjunction with the word 'rape' in the Parker et al. study.

Although there was no significant difference between groups, there was a significant difference in overall response times across the conditions of Study 3 (see Table 4.6). All subjects were quickest in the baseline condition. The responses for the neutral and emotion words were not significantly different from each other. The response times for the arousal words were the slowest for all subjects. There was a trend for the response times for the alexithymia groups to move in the expected direction; the quickest responses being for the low alexithymia groups and the slowest responses for the high alexithymia groups in each condition. Given the possibility that NA may be a contributing factor in alexithymia, and in attending to a stimulus, the fact that high alexithymics were slowest in the baseline condition may be due to a high level of NA. Results from a later regression analysis on the data suggest that NA may be implicated in the ability to 'disengage' and 'shift' attention from one stimulus to the other. However, it seems somewhat surprising,

in the light of this argument, that NA did not have more of an effect in the Stroop Task. This could be due to the nature of the stimulus: i.e., words rather than facial expressions. The fact that there was no significant difference between groups may also be due to the nature of the Stroop Task. It appears to be a somewhat clumsy and crude method of measuring subtle clinical differences, and may be better used in, say, cardiovascular studies, in order to create stress or tension for susceptible subjects.

In the course of administering Study 3 it became apparent to the experimenter that the words which each subject found the most distressing did appear to cause the most interference. For instance, if the subject had particularly noticed the word 'anger' then the emotion condition tended to be the slowest for that subject. However, those words which seemed to affect individual subjects were specific to each subject and could have belonged to the neutral, emotional and arousal conditions, although most did seem to belong to the arousal condition. This variability in specifically distressing words might explain the variability in response times which may have contributed to washing out any between group effect or interaction. However, specifically chosen arousal or emotion words for specific clinical populations might well incur greatest interference in the colour naming Stroop task, as seen in the Parker et al. study (1993a). It appears that emotion words as such are are not distressing for alexithymics. Perhaps the words have little affective significance due to the fact that emotion words may, in the case of alexithymia, have been assigned via cognitive, rather than emotion processing systems, as in the case of 'reentrant processing' (Posner, 1994).

It may be of significance to the understanding of alexithymia as a construct to consider that arousal, rather than emotion, appears to be a significant factor. Although significant group differences were not found in this study, the trend for high alexithymics to be slower in responding than low or moderate alexithymics was more pronounced in the arousal condition than in the emotion condition. Arousal was defined as 'most distressing' in Study 3. The implication from these studies, and from previous research (Bagby, Taylor, & Parker, 1994), is that alexithymics experience undifferentiated 'distress' as opposed to a specific emotion. It may, therefore, be more appropriate to think in terms of the 'distressing' rather than the 'threatening' or 'stressful' effects of presenting the stimuli with a temporal constraint condition. This would tie in with the results of Study 2, where time, in the form of temporal constraint, appeared to cause the most interference. If the temporal constraint condition acted as a means of 'heightening arousal' in the sense of being distressing, this could be the situational factor which has the most impact on alexithymics. In other words, being aroused or distressed may cause the most interference in the processing of emotional information for alexithymics in particular, and for everyone to a lesser extent. It may also tie in with the fact that alexithymics are described as having a higher baseline heart rate and tonic activity (Wehmer et al., 1995).

5.5 Disentangling Negative Affectivity and Alexithymia

In spite of the substantial correlation between negative affectivity and alexithymia, negative affectivity did not appear to affect the accuracy of response to emotional stimuli in either time frame in Study 2. The fact that alexithymics were differentially affected by temporal constraint in Study 2 but not in Study 1 lends support to the argument that the

deficit in emotion processing occurs after a stimulus has been attended to, and is specific to perceptual mechanisms of emotion recognition, rather than attention mechanisms. In other words, alexithymics were not impaired in perceiving a difference in the emotion condition in Study 1. In Study 2, they were, however, impaired in emotion recognition, which is a later stage of information processing.

In these studies, alexithymia and negative affectivity do appear to be separate constructs with different underlying neural mechanisms. The differences between the two constructs have distinct behavioural implications. Results from a later regression analysis of these data in which the dependent variables were the respective sensitivity measures of each study and the explanatory variables were phase order, alexithymia, and both positive and negative affectivity, mostly confirmed the original ANOVA analyses. An interesting addition to the results was a significant effect of negative affectivity in Study 1 for accuracy in perceiving facial differences in the emotion condition. The results from Study 1 suggest that, rather than measuring recognition of emotion versus identity, this study was measuring the ability to compare and perceive differences between facial features, or attend to facial features. The results from Study 1 appear to suggest that emotion processing is more complex than identity processing.

In the light of these studies and of previous research suggesting separate neural mechanisms in processing emotion and identity recognition at higher levels, it seems to make sense to consider that negative affectivity is significant in the attention stage of emotion information processing, while alexithymia is significant at the perception and recognition stage of emotion processing. Higher levels of negative affectivity may result

in slower shifting to stimuli, and slower disengaging from, or neglecting of stimuli. In other words, negative affectivity may affect our ability to shift attention from one stimulus to another, i.e. back and forth. Negative affectivity may therefore have a diffuse and generalized impact on information processing, and on emotion processing in particular, since this impact occurs earlier in the processing of sensory information. The demands of Study 1 were that the subject had to scan two faces within one second and compare the faces. In other words, the subjects had to be able to shift their attention from one stimulus to the other under temporal constraint. This study therefore measured ability to perceive facial differences and neglect, disengage, shift, and engage attention. However, there is nothing in the results to suggest that negative affectivity affects our ability to identify, recognize, or discriminate among emotions. On the other hand, while alexithymia may not be a crucial factor at the attention stage of emotion processing, it appears to be a significant factor in the perception and cognition stage of emotion processing.

Thus, the results of Study 1 appear to indicate that while alexithymia is not implicated in shifting attention from one stimulus to the other, negative affectivity may be. This is an important distinction, since it implies that NA may have a more generalized effect and that the effects of alexithymia may be specific to emotion recognition. It also appears that for alexithymia to exist, there may have to be high levels of negative affectivity, but that conversely, high levels of negative affectivity do not imply alexithymia. It would be interesting to compare subjects who are high in negative affectivity and low in alexithymia with subjects high in negative affectivity and high in alexithymia. The

descriptive statistics from this subject pool indicated that very few subjects tended to be low in negative affectivity and high in alexithymia, and only seven subjects were high in positive affectivity and high in alexithymia. These numbers again lend support to the speculation that negative affectivity may be a precursor to alexithymia, and may affect our flexibility in shifting attention, while positive affectivity may be a protective factor for alexithymia and may aid flexibility in attention mechanisms.

Negative affectivity appears to have an impact on our ability to attend to an emotional stimulus, be it shifting, neglecting, engaging or disengaging attention. Alexithymia does not appear to be implicated in our ability to attend to a stimulus. It does, however, appear to be implicated in our ability to recognize emotions and discriminate among them.

5.6 The Role of Language in Alexithymia

Alexithymia implies 'no words for feelings', yet it has been unclear from the literature as to the exact nature of the problem underlying the construct. Although there are differences between alexithymics and non-alexithymics in emotion processing, alexithymics are able to detect, attend to, perceive, recognize, label and express emotion. They appear to be somewhat impaired emotionally, yet their impairment is subtle (McDonald & Prkachin, 1990; Parker, Taylor, & Bagby, 1993b). The construct has been clouded by a vague idea that something is amiss; however, it has been difficult to pinpoint the problem, investigate the underlying neural mechanisms, or understand the ensuing behavioural ramifications. Results from Study 2 would indicate that this ability to have words for and describe an emotion might play a pivotal role for emotion recognition in the

construct of alexithymia, if the situation demands that subjects respond quickly and under pressure.

The concept underlying Factor II or Difficulty in describing Feelings, that of labelling emotion or having words for emotions, is reminiscent of the work by Lane and Schwartz (1987). They put forward the idea that emotional awareness, descriptive accuracy and ability to label emotions may be protective factors in psychopathology. The suggestion was made that there are five levels of emotional awareness, ranging from the crudest to the most sophisticated form. The crudest form, the 'sensorimotor reflexive' would allow a person the subjective awareness of bodily sensations. The second level, described as 'sensorimotor enactive', allows for action and arousal. The third level, 'preoperational', implies that a person has a limited experience of emotional extremes. The fourth level, or 'concrete operational', implies that a person can differentiate among emotions, and experiences blending of emotion. The fifth and most sophisticated level, 'formal operational', allows a person to describe complex and differentiated qualities and intensities of subjective emotion. If, as is proposed in these studies, alexithymics 'fast-track' emotional information in certain situations, this would imply that their emotion processing is somewhat crude. Alexithymics are also described as confusing bodily sensations with subjective feelings. The crude 'fast-track' processing and emphasis on bodily sensations both suggest the 'sensorimotor reflexive' or lowest level of emotional awareness as described by Lane and Schwartz (1987). However, this suggestion of cruder processing in alexithymia applies only to emotion stimuli.

5.7 Blindsight and Alexithymia

The conclusions that can be drawn from the results of Study 2 are also reminiscent of the concept of blindsight (Weiskrantz, 1986). Blindsight is implicated in situations where information may be implicitly processed, yet be outside conscious awareness, and therefore not available for verbal articulation. Blindsight implies that a person may not be consciously aware of a stimulus. However, there is an implicit knowledge of the stimulus, but this knowledge is not available for conscious processing. In other words, the person may not be able to describe or identify the stimulus to themselves or others, but they may have an inkling that something is awry, yet be unable to know the cause of their discomfort.

Blindsight is not an easy concept to understand, although it is a fascinating phenomenon. It requires a certain level of interest in, and knowledge of, neural mechanisms. It also requires an acceptance of the concept of parallel processing of information on both the implicit and explicit levels of awareness. Blindsight may be experienced in a number of ways, depending on the neurological damage or functional impairment. Of relevance to alexithymia is the notion that there is a language attention system, in which the lateral frontal lobe, the inferor parietal lobule (IPL) and the anterior cingulate appear to be implicated (Posner & Petersen, 1990). The right anterior cingulate is also implicated in higher levels of emotion processing (George et al.,1993). The cingulate cortex is connected to the IPL: this latter area appears to be an "integrative centre, synthesizing information from exteroceptive sensory systems, limbic and viscerosensory areas, and from arousal systems" (p. 354) and acts to mediate conscious

feelings (Ledoux, 1986). Any evaluation of incoming sensory events which do not reach the IPL remains implicit or unconscious. In this event emotional expression is automatic or behavioural and without conscious awareness. A second attempt to process this already crudely processed information may be made via 'reentrant processing'; it is thought that "higher level associations are made by fibers that reenter the brain areas which processed the initial input" (Posner, 1994, p.7402). However, Ledoux (1986) suggests that the subsequent evaluation of the stimulus event is made by cognitive, rather than emotional processing systems, and may be wrong, since it is based on imprecise or false assumptions or inferences. The underlying principle is the same as in the concept of 'fast-tracking', except that the latter refers to amygdala processing and is associated with the emotion of fear (Ledoux, 1994).

5.8 Implications of Blindsight for Health

We may assume from the present studies that alexithymics do process emotional information, but that this processing may not reach conscious awareness in certain circumstances which are perceived as threatening, distressing, or uncomfortable. Emotions, therefore, may not be fully processed or cognized by alexithymics. In studies investigating the relationship between emotion disclosure and health it has been suggested that the ability to write about trauma and describe the feelings or experiences connected with the trauma, may act as a protective factor in health (Pennebaker & Hoover, 1983; Pennebaker, Hughes, & O'Heeron, 1988; Pennebaker, Kiecolt-Glaser, & Glaser, 1988; Petrie, Booth, Pennebaker, & Davison, & Thomas, 1995). In the light of these studies, alexithymics then, would be at a disadvantage, since much of their emotion processing

does not appear to be conscious, and therefore may not be available for disclosure. Alexithymics, therefore, may be more at risk for certain health related problems. The findings of Study 2 imply that alexithymics may be processing certain emotional stimuli in a crude form given temporal constraint, contributing perhaps to the lack of differentiation of distress suggested by Bagby, Taylor, and Parker (1994). Low and moderate alexithymics, for whom the details of the stimulus are understood, may process these stimuli in a less crude form when faced with excessive demands. For high alexithymics, this crude processing may be a chronic condition given that many expressions of negative emotion are fleeting, and the processing of these fleeting emotional stimuli may therefore place excessive demands on high alexithymics. This is consistent with the suggestion that alexithymics have a deficit in the spontaneous encoding of negative emotions (McDonald & Prkachin, 1990).

Alexithymics may habitually process sadness, anger and fear imprecisely. How then, are they to deal with the fact that often they may be sensing unease or fear, but that they do not have an explanation for this sensation, nor are they able to discriminate among the feelings? Whilst they may know on the one hand that something is amiss, they may, on the other hand, be unable to put the feeling into words, communicate it precisely to others, or understand what is really happening to them. This feeling of knowing without knowing is an experience which most people will have had now and again. However, when it is a chronic condition and occurs habitually in given situations, it may become a problem with ensuing ramifications. In other words, while most people experience the inability to put feelings into words occasionally, for high alexithymics it may be a chronic

condition. A chronic inability to put feelings into words may lead to somatic problems (Paez, Basabe, Valdoseda, Velasco, & Iraurgi, 1995). Perhaps this crudely processed and incomplete information is subsequently processed via 'reentrant processing'. The confusion over understanding the original sensation or experience may lead to a subsequent psychosomatic explanation. In other words, a low level of emotional awareness and crude processing of the meaning of the stimulus could be subsequently, but falsely, interpreted as a somatic sensation.

Difficulty in describing emotions seems to be a pivotal factor in the impairment of emotion recognition in alexithymia. Therefore, the key to understanding the reason for alexithymics being potentially at risk for psychosomatic and psychiatric disorders may be found by investigating the neural mechanisms underlying alexithymics' difficulty in describing feelings. The area of focus should be the interaction of neural mechanisms responsible for both the 'fast-tracking' of information and the language attention system, with its putative areas: the lateral frontal lobe, the IPL, and the anterior cingulate. It seems plausible to consider that the inability to discriminate amongst negative stimuli when in a distressing situation leaves a person at risk for misinterpreting the situation. Conversely, it seems plausible to consider that the more accurately we label and discriminate amongst negative stimuli, the better able we are to accurately interpret the situation, and the feelings attached to the situation. A chronic inability to discriminate among negative sensory stimuli could have repercussions in many areas, which is perhaps the reason for the association of alexithymia with many other psychopathological disorders. It also seems plausible to consider that levels of emotional awareness and

emotional verbal acuity are bound together with the concept of consciousness, in the guise of AK and DK. Both the concept of levels of emotional awareness and the concept of blindsight appear relevant to the construct of alexithymia. It seems reasonable to speculate that an inability in verbalizing emotions and a form of blindsight in this area may leave a person at risk for health and well-being (Pennebaker, Hughes, & O'Heeron, 1987).

5.9 Differences in the Recognition of Sadness, Anger and Fear

Study 2 was limited to assessing whether alexithymics differed from non-alexithymics in their ability to perceive whether an emotion was present or not. In other words, the subjects in this study were not asked to differentiate between, or accurately label, the separate emotions. However, an unexpected finding in Study 2 was the significant difference in the ability to accurately recognize the presence of individual emotions; sadness, anger and fear. This finding implies an inherent and implicit ability to internally attend to, perceive, recognize and discriminate among the three separate emotions. Given the theories surrounding the language attention system, the concept of blindsight and of 'fast-tracking' or crudely processing stimulus information, this finding may imply an inherent ability to implicitly label these emotions, or it may indicate an explicit impairment in labelling emotions. The overall recognition of sadness was significantly less accurate than that of anger, and the recognition of anger was significantly less accurate than that of fear. Only the recognition of sadness appeared to be significantly impaired in the one second time frame, when compared to the three second time frame, although there was a trend towards increasing accuracy in the recognition of anger, and then of fear.

Alexithymics are described as having outbursts of anger and sobbing, but not as having moments of intense fear. Confusion over anger and sadness, therefore, seems relevant to alexithymia. The high alexithymic group was significantly less accurate in their recognition of emotions than the low and moderate group. Subjects who had the most difficulty in describing feelings were the most impaired in their overall recognition of sad, angry and fearful stimuli in the one second time interval, whilst their responses were comparable to the low and moderate groups in the slower condition (see Figure 4.1). Subjects who had the most difficulty in identifying feelings, or who belonged to the high Factor I group, were significantly more impaired as a group in their ability to accurately recognize sadness in the one second, as opposed to the three second, time interval (see Figure 4.3). Factor I, or Difficulty in Identifying Feelings, is comprised of questions which measure confusion over feelings and the ability to discriminate between physical and emotional sensations (see Appendix A).

5.10 Theoretical Implications of Differences between Emotions

What are some of the more general implications that can be inferred from finding differences in the recognition of individual emotions? The data from this study suggest that fear is the most accurately processed of the three negative emotions presented in this study in both temporal conditions, and that this accuracy is uniform for all subjects and all alexithymic groups. The greatest impairment in accurately processing an emotion was in the facial expression of sadness, and this impairment was evident in all groups. It was most evident for those with the most difficulty in describing feelings, and most affected by the condition of temporal constraint for those with the greatest difficulty in identifying

feelings. One possible explanation for the difference in accurate recognition of the three emotions may lie in their specific physiognomy (Ekman, 1977). Facial expressions of anger and fear as shown in Ekman and Friesen's Pictures of Facial Affect (1976) tend to involve larger numbers of physiognomic changes than facial expressions of sadness. Facial expressions of fear involve the raising of the inner and the outer brow, the lowering of the brow, the raising of the upper eyelid, the tightening of the lower eyelid and the horizontal stretching of the lips. Facial expressions of anger involve the tightening of the lower eyelid, the raising of the upper eyelid, chin raising and lip tightening. Facial expressions of sadness involve the raising of the inner and outer brow and lip corner depressing. This quantitative element may contribute to differences in recognition accuracy for the three emotions.

From an evolutionary standpoint one would expect there to be greater accuracy in recognizing fear, since it is often externally and contextually driven, and therefore crucial to survival, whilst sadness tends to be perceived internally and less contextually. Sadness may be less important from an evolutionary perspective, although it may play an important role in our health and well-being. Psychiatric and psychosomatic problems may arise from a generalized lack of differentiation of negative emotions, or they may arise from an impairment in the perception of sadness rather than from an impairment in the perception of fear. Does this then imply that 'fast-tracking', in the case of alexithymics, has more to do with distress over the inability to recognize sadness? Fear, after all, was the most accurately recognized of the emotions in these studies, and therefore the least likely, according to the present analysis, to be 'fast-tracked' or crudely processed. 'Fast-

tracking' may simply be a phenomenon which occurs in moments of distress, and when excessive demands are placed on a person. It may not be specific to 'fear' processing, but may apply to any situation deemed distressing for alexithymics.

One interesting inference is that alexithymia may be largely due to an impairment in the recognition of sadness. Sadness in itself may well be an emotion which has been overlooked by researchers. Anger and fear seem more socially acceptable emotions, while sadness is shunned and often treated with contempt. For instance, it has been unacceptable, in our culture, for men, or even boys, to cry. Alexithymia is associated with many psychological and psychiatric disorders, and if sadness, or an inability to accurately recognize sadness is also associated with alexithymia (see Figure 4.3), this finding suggests that more attention should be paid to the inter and intrapersonal experience of sadness, and perhaps even to the necessity of this emotion, and its importance in the area of health.

5.11 Alexithymia and the Development of Emotions

Another possible explanation for differences in the recognition of emotions may be found in the literature investigating the development of emotions. According to Lewis (1995) the expression of sadness may be seen on an infant's face at three months. Facial expressions of anger usually appear at four to six months, while facial expressions of fear are not expressed until the infant is seven to eight months old. The initial facial expressions of fear seen on an infant's face coincide with the timing of increased activity in the prefrontal cortex: an area of the brain associated with discriminating among threatening stimuli in humans (Kalin, 1993). Somewhere between seven and twelve

months of age children begin to gauge their level of fear by interpreting expressions seen on a parent's face: a form of 'social referencing' and 'self-regulation'. Since alexithymics appear to be able to recognize facial expressions of fear as accurately as non-alexithymics, the impairment seems to be due to a lack of accuracy in recognizing sadness, and to a lesser extent, anger, when in a demanding situation. This suggests that the impairment or deficit for primary alexithymia may originate in the first half year of an infant's life, and leave them at risk for an inability to differentiate quickly among anger, sadness and fear.

Since alexithymics' recognition of these facial expressions of emotion appears normal when there is no temporal constraint, the deficit is unlikely to be structural. It seems more likely that alexithymia is due to a functional impairment: an impairment in the sense that the infants are interpreting a non-threatening stimulus as an unknown and therefore distressing stimulus and then overcompensating by 'fast-tracking' the information. This may happen at a time when the hippocampus has yet to fully mature and the infant's memory is more dependent on the amygdala. There is evidence to suggest that the amygdala matures at an earlier stage of development than the hippocampus (Ledoux, 1995). Any memories relying on the amygdala circuit may well be inaccessible to conscious processing. The hippocampus appears to provide contextual information regarding a stimulus, while the amygdala may assign its 'emotional' significance, irrespective of the method of processing and the details of the stimulus. It seems likely, then, that there is a developmental window in which an interaction of late hippocampal activity, high anxiety, and a traumatic event associated with perceived

negative affectivity may occur and leave a person at risk for alexithymia. It also seems likely that high anxious infants are predisposed towards alexithymia. However, not all high anxious infants are at risk, nor will they develop alexithymia. Only prospective studies could confirm this theory and disentangle the various categories of anxiety and how they may, or may not, interact with alexithymia.

5.12 Limitations of Studies 1, 2, and 3

The results of these studies should be generalizable to a normal adult population with a similar cultural background. Although the subjects in these studies belonged to a student population, the University of Northern British Columbia tends to have a higher enrollment of mature students, with general workforce experience, than other universities. This fact is reflected in the higher mean age (M=26.5) of the subjects than is typical in university samples. The results are only generalizable within the context of these studies.

Alexithymia seems to have developmental significance. However, these results are not generalizable to children, and if children were to be measured there would have to be changes to the methodology. It seems likely that children may be slower in processing emotional information. The TAS-20 seems somewhat adult in its orientation and may be unsuitable for children. These studies addressed the concept of primary alexithymia. No personal histories were taken from the subjects and it is unknown as to whether the high scores could be attributable to secondary alexithymia. Secondary alexithymia may be due to delayed development resulting from some traumatic event in a person's childhood.

It was an arbitrary decision to use the tercile split for the TAS-20 scores and a median split for the PANAS scores. It could be argued that the PANAS scores should be

treated similarly to the TAS-20 scores. One potential limitation of this study was the fact that the TAS-20 and PANAS scales are self-report measures, and that the subjects were completing these scales without complete anonymity. It may be wise to use an additional measure, such as the Levels of Emotional Awareness Scale (Lane, Quinlan, Schwartz, Walker, & Zeitlin, 1990) in order to assess emotional insight.

The method of presenting the stimuli in Study 1 and 2 in a file folder was efficient, if somewhat primitive. A more hi-tech approach: using video and editing equipment, with a computer based printout for the responses, might result in different or more pronounced results. A more precise presentation of the stimuli on video for 1:30th of a second exposure, followed by a one or three second interval for the response might result in greater between group differences. In the present studies the responses were manually recorded by the experimenter. The vast majority of responses were obviously within the time frame and were clearly responses to the numbered stimuli. Occasionally the experimenter had to make a subjective judgement call for late responders. This subjectivity could be eliminated if the subjects responded by pressing a button connected to a computer. There are positive and negative aspects to both the high and low technological approaches. For an exploratory study, the methodology used in these experiments seems adequate. It should be borne in mind that it may not be possible to generalize from the laboratory results, using photographs, to the real world.

CHAPTER 6

Summary, Conclusions, and Directions for Future Research

The experiments undertaken in Study 1 and Study 2 were exploratory in nature. The hypotheses originated from three different perspectives. One perspective was behavioural; simply realizing from observation that people do seem to vary in their ability to verbalize how they are feeling. Another perspective was neurological; considering brain structures and functions, and how small, seemingly insignificant variations can have important repercussions and interaction effects. The final perspective came from drawing the behavioural and neurological perspectives together to find a construct which seemed to fit the observed behaviour and hypothesizing about the neural mechanisms which might be implicated in the construct.

6.1 Theoretical Implications of Study 1 and Ideas for Future Research

In Study 1 it was expected that a difference would be found between alexithymics and non-alexithymics in their ability to attend to identity versus emotion stimuli. While there were no significant group differences, there was a significant difference in comparing facial expressions of emotion and facial identity. This result implies there is a difference in information processing between emotion stimuli and identity stimuli: this needs to be further investigated. Future research might also consider investigating identity stimuli versus separate emotion stimuli. While Study 1 appears to provide evidence for an overall difference in accuracy while attending to emotion versus identity stimuli, in light of the results of Study 2 it may be important to test this difference in accuracy while

attending to either sadness, or fear or anger versus identity stimuli. In other words, whilst there appears to be an overall tendency to respond more accurately given temporal constraint to identity versus the combined emotions of sadness, anger and fear, this difference in accuracy may not hold when identity stimuli are compared with facial expressions of fear stimuli. Facial expressions of fear were the most accurately recognized of the three negative emotions presented in Study 2. We may attend more accurately to facial expressions of fear than to those of sadness, given temporal constraint, and the difference in accuracy between fear and identity stimuli may no longer be significant.

Several subjects raised the possibility that gender may also be a factor in emotion processing. Is it easier for men to process male facial expressions of emotion and women female expressions of emotion? A question that was raised by both subjects and the experimenter concerned the neutrality of neutral facial expressions. How neutral is neutral? The results indicate that neutral expressions were recognized as such, but the accuracy in recognizing these 'noise' images may have been influenced by context. How much does context, or the surrounding images, affect the processing of each individual image, and in particular, on neutral faces? It has been suggested that context plays a role in the recognition of emotions but that the relationship between emotion and context is complex (Fernandez-Dols, Sierra, & Ruiz-Belda, 1993), and that ratings of neutral faces vary according to the situational cues presented (Carrera-Levillain & Fernandez-Dols, 1994). Neutral expressions are, for the most part, assessed as neutral. However, they do contain affective meaning, and this meaning appears to have the most influence when the facial expression is seen in a clear, but unusual context. In uncommon situations, it seems

that neutral faces can have as much influence in understanding the situation as prototypical expressions of basic emotions. It seems unlikely that Study 1 and 2 provided an uncommon context, but this possibility could be explored in future research. These studies only addressed a limited context, and future research is needed to disentangle the contextual implications.

6.2 Theoretical Implications of Study 2 and Ideas for Future Research

In Study 2 it was expected that alexithymics would be more impaired in processing emotion stimuli when excessive demands, in the form of temporal constraint, were placed on them. This hypothesis was confirmed, and it was found that the impairment appears to be associated with difficulty in describing feelings. Future research may investigate the neural mechanisms underlying language attention systems, in particular the anterior cingulate, the IPL and the lateral frontal lobe, and how stressors may impact on these mechanisms. Future research may further examine the differences in emotion processing of sadness, anger and fear.

Alexithymia is conceptually associated with language. Results from Study 2 indicate that accuracy in recognizing emotion is significantly related to our ability to describe emotions. In previous research the suggestion has been put forward that the right anterior cingulate and bilateral inferior frontal gyri are implicated in emotion recognition in higher order processing (George et al., 1993). The anterior cingulate is also implicated in the language attention system (Posner & Petersen, 1990). The Inferior Parietal Lobule, with its connections to the frontal gyri and the anterior cingulate, is suggested to be the area of "mediation for conscious feelings" (Ledoux, 1986, p.354).

Both the neurological evidence and the results from Study 2 appear to lend support to the argument that alexithymia is implicated in higher order processing, and it appears to be linked to language, or the ability to put feelings into words. On the other hand, there is nothing to suggest that negative affectivity is directly linked with this stage of processing.

The hypothesis that higher levels of alexithymia as measured by the TAS-20 would result in less accurate processing of emotion stimuli was confirmed. Most importantly, the results of these studies helped to disentangle the alexithymia and negative affectivity constructs and provide evidence that alexithymia not only is a viable construct, but also has particular behavioural ramifications which are not necessarily shared by negative affectivity. Future researchers may wish to further disentangle NA and alexithymia. What is it specifically in NA that potentially triggers alexithymia? The PANAS (see Appendix B) measures various feeling states associated with NA. It is possible that a particular state, i.e. nervousness or distress, might contribute to alexithymia. Since alexithymics do appear to be 'fast tracking' information when under constraint, resulting in cruder processing, one investigative approach might be to measure cortisol levels, since cortisol may contribute to the 'vigilant' and alert state suspected in alexithymia. It would be interesting to find out, in future research, what alexithymics do actually experience, both subjectively and physiologically, when they view negative emotion stimuli, and whether their experience is different for verbal and non-verbal stimuli.

In these studies the emphasis was placed on comparing negative affectivity with alexithymia. Future research may compare alexithymia and positive affectivity, with the hypothesis that positive affectivity may be a protective factor in emotion processing, and

also a protective factor in health and well-being. High levels of positive affectivity may allow for normal or quicker shifting to emotion stimuli. It has been suggested that alexithymia is associated with low levels of positive family communication (Berenbaum & James, 1994).

Another area of future research may be to replicate these studies but with auditory, rather than visual stimuli. The inference in these studies is that alexithymia is associated with a functional impairment in the processing of visual emotional stimuli. It is possible that auditory emotional stimuli processing may have similar impairments. The concept of 'fast-tracking' has been implicated in the auditory system. It is not known how it functions in the visual system. It would be interesting to investigate how tone, context and facial expressions of emotion interact.

6.3 Theoretical Implications of Study 3 and Ideas for Future Research

An observation made by the experimenter during the administration of Study 3, was that some subjects tended to laugh easily, some appeared unaffected, and some seemed tense whilst doing the Stroop Task. Future research might consider administering a humour questionnaire, such as the Situational Humour Response Questionnaire (Martin & Lefcourt, 1984) in order to shed light on the effect of humour on tension, and indirectly, on health issues such as cardiovascular disease.

6.4 Future Research for the 'Fast-tracking' of Stimuli

'Fast-tracking' has been described as a response to threatening stimuli, and has been associated with the processing of fear (Ledoux, 1993). Although it is tempting to assume that the temporal constraint condition of Study 2 is perceived as threatening by the high

alexithymic group, this is an assumption. Perhaps future research could provide evidence supporting that assumption. Or, conversely, future research might pinpoint the exact nature of 'fast-tracking' and its situational cues. This study seems to lend support for the condition of temporal constraint as a situational cue for 'fast-tracking'. In an experiment similar to Study 2, facial expressions of emotion could be presented in rapid succession in one condition, and slower in the other condition. Alexithymics could be asked to indicate whether an emotion is present or not, whether it is similar to the previous exposure, and whether they liked the expression more or less than the previous exposure. If alexithymics cannot discriminate between exposures, but they indicate a dislike for the facial expressions of sadness, anger and fear, this would indicate that they are recognizing the threat level but not the emotion itself.

Similarly, in a second experiment, alexithymics could be exposed to a rapid succession of neutral, sad, angry and fearful faces, and asked to state whether an emotion is present or not, with the expectation that their responses would be less accurate than non-alexithymics for the sad, angry and fearful faces. Subsequently, they could be exposed to a rapid succession of facial expressions of emotion on the same faces and asked to state which faces they recognize. Following the argument put forward by Zajonc (1980) that memory recognition is intensified by affect, and is better for objects liked or disliked, it would be expected that alexithymics would have a higher recognition rate for the angry, sad and fearful faces than the non-alexithymics. Zajonc (1980) also argued that people tend to form preferences for things they cannot identify. This proposed experiment could provide evidence suggesting that, while alexithymics are less

accurate in consciously discriminating among emotions, confusing fearful, angry and sad faces, they do implicitly feel those emotions, and experience them as threatening given temporal constraint.

This idea that the emotion is somehow subjectively experienced when objectively processed is reminiscent of 'knowledge by acquaintance' (AK), or the concept of qualia (Buck, 1993). It also implies that both interoceptive and exteroceptive processing of an emotion share common neural mechanisms. Emotional experiences and the perception of expressions of others may be processed at the same time, in the same place or in the same systems. In other words, if a person witnesses a fearful expression, they also experience that emotion, albeit implicitly, within themselves, suggesting that the internal experience and the external recognition are processed simultaneously and together. AK does not imply any knowledge about the stimulus or 'knowledge by description' (DK). DK requires an understanding of the experience, the ability to label the experience, and to put it into words (Buck, 1993). It seems likely, and these proposed experiments might lend support for the hypothesis, that alexithymics experience AK, but fail to experience DK in the area of emotion recognition.

6.5 The Importance of Time in Emotion Processing

Another important aspect of Study 1 and Study 2 lies in the methodology itself. Presenting subjects with fairly straightforward stimuli and manipulating the temporal condition is a novel approach to the investigation of emotion processing. The results from using this methodology do seem to suggest that time is an important factor in the processing of emotions, and the manipulation of time may shed light on impairments in

neural processing. In hindsight it may seem obvious that temporal constraints will lead to overall differences in the perception of emotion, and also to group differences in emotion processing. The idea for manipulating time came from an interest in Ledoux's work on 'fast-tracking' threatening information and also from an interest in the behavioural problems affecting autistic children.

Autism appears to be an acute disorder due to the lack of integration, and potentially lack of temporal coordination, of sensory stimuli. Although most clinicians would see the two disorders, autism and alexithymia, as categorically different, there appears to be a certain commonality between them. One commonality is that there seems to be a need for sufficient processing time. Put another way, autists and alexithymics do not appear to tolerate temporal constraint on sensory processing in some situations. While the impairment in autism is likely found in the attention stage of information processing (Courchesne et al., 1994; Ross, Radant, Young, & Hommer, 1994; Wainwright-Sharp & Bryson, 1993), and an impairment in an earlier information processing stage might imply a more acute and diffuse disorder, alexithymia appears to be a specific problem associated with higher order processing in the recognition of emotions at a later stage of sensory information processing.

6.6 Temporal Processing and Clinical Populations

Alexithymics as such cannot be differentiated from non-alexithymics by their outward appearance, or by their behaviour for the most part. It is only when excessive demands or certain situational constraints are in place that difficulties in emotion processing become obvious. Alexithymics then appear to become more distressed and to

experience greater interference with sensory processing. It seems likely that many psychiatric and psychological disorders share common deficits in processing sensory information when presented with some form of temporal constraint, and this method of experimentation could be used with other clinical populations. The subjects in these studies were all part of a normal population and the effects seen within these studies are among people who differ largely within a normal range. However, the ramifications of this impairment are far reaching and may extend beyond the known associated disorders to other groups of people or clinical categories, i.e. the prison population, sexual and physical abusers. It may be important to compare alexithymics with similar, but different, groups. Internalizers, inhibitors, and repressors could be compared with alexithymic groups using the methodology from Study 2.

6.7 The Possible Primacy of Affect

It seems likely that affect, rather than cognition, may play a primary, if implicit role, in behavioural responses of certain clinical populations with specific disorders, given temporal or other situational constraints. The challenge will be to provide therapy for disorders where primacy of emotion is suspected in situations of temporal constraint. It will require teaching people to translate AK into DK in order to halt the 'fast-tracking' of distressing sensory information. The challenge will be to enable these people to confront the distressing stimuli, and, in a sense, to relax, in order to learn to slow down their processing. Then they may be able to catch the details of the stimulus in the first round of processing, and be able to know and understand it, and be in a position to describe whatever it happens to be. Although it is tempting to view primary and secondary

alexithymia, such as PTSD, as one and the same disorder, this may be an erroneous assumption. Future research is needed to investigate, and potentially disentangle, these two disorders. While PTSD clients appear to behave similarly to alexithymics, they may, however, have more in common with repressors, and therefore warrant a different mode of therapy. In order to devise therapeutic treatment for alexithymics, there seems to be a need to pinpoint the interactions between the neural mechanisms responsible for language attention systems, the processing of facial expressions of emotion and 'fast-tracking' mechanisms. It may be useful to consider habituation and extinction rates for alexithymics with the expectation that for certain stimuli, extinction may be eliminated. Facial expressions of emotion other than sadness, anger and fear may be examined using this methodology in the context of alexithymia.

6.8 Developmental Implications of Alexithymia

The evidence from these studies only provides support for the hypothesis that alexithymics are less accurate in recognizing emotion given temporal constraint. Future research could look at the ability of alexithymics to label or describe emotions both with and without temporal constraint. It would be expected that alexithymics have the most difficulty in labelling emotions given temporal constraint, and high alexithymics may experience greater difficulty than low alexithymics in labelling emotions in a slower condition. It would be interesting to find out whether they can learn to correctly label emotions, or whether this ability, similar to other linguistic abilities, is lost once the critical learning phase is passed. If this were the case, if the ability to label emotions is lost after a certain age, it would become important to assess children early for alexithymic traits,

with a view to helping them discern differences between the emotions. A scale designed to measure alexithymic traits in children would be needed for early assessment.

A closer look at the association between psychosomatic illness, difficulty in describing feelings, sadness and alexithymia may be warranted. Being able to recognize an emotion, label it, and simultaneously experience it, may be the key to understanding the association between alexithymia and psychosomatic disorders.

6.9 Disentangling the TAS-20 Factors

However, we cannot assume that difficulty in describing feelings is the sole reason for emotional impairment in alexithymia, or the key factor in understanding the link between alexithymia and other problems. In the pilot study conducted at UNBC (Parker & Prkachin, 1995), several measures were correlated with the TAS-20. One of those measures, the Psychosomatic Symptom Checklist or SUNYA had the highest correlation with Factor I or difficulty in identifying feelings. This correlation suggests that the ability to identify feelings is a significant factor in psychosomatic disorders and alexithymia. Factor II, or Difficulty in Describing Feelings, appeared to correlate most highly with measures of negative affectivity, personal distress and lack of social support. Although it might be tempting to narrow the measure of alexithymia by eliminating extraneous questions or factors from the TAS-20, we do not as yet know how these factors impinge on one another, and interrelate. It would appear from the literature (Linden, Wen, & Paulhus, 1995), and from a factor analysis conducted at UNBC in conjunction with the pilot study (Parker, 1995), that some revision of the TAS-20 scale might be warranted.

The most significant difference in recognizing sadness in the one and three second intervals was found in the group experiencing the most difficulty in identifying feelings. Perhaps Factor I helps to pinpoint the key problem of this disorder: an inability to accurately identify sadness, and to a lesser extent, anger. Factor II, or Difficulty in describing feelings may pinpoint the importance of being able to verbalize emotions and communicate feelings to others. Investigation of Factor III, or Externally Oriented Thinking, may shed light on associated behaviours and may act as a marker for people at risk for psychiatric and psychosomatic disorders associated with alexithymia. What is fascinating about this construct is the fact that it is possible to investigate it at each factorial level. These studies unwittingly focussed on Factor II, or Difficulty in Describing Feelings, and shed some light on Factor I, or Difficulty in Identifying Feelings.

6.10 Summary

It seems to have been beneficial to run the three studies in conjunction with one another, since each study focused on a specific stage or type of processing. This allowed the experimenter the opportunity to disentangle some of these processes and their interaction with alexithymia and negative affectivity. Study 1 focussed on attention processing and the ability to attend to, neglect, disengage from and engage attention. Study 2 focussed on the recognition of emotion processing. Study 3 shed some light on the role of arousal in alexithymia. It seems that negative affectivity may be important in attention processing, while alexithymia appears to be a deficit in emotion recognition. It seems likely that heightened arousal and distress may be associated with alexithymia.

Negative affectivity may interact with, and contribute to alexithymia but high NA may not necessarily result in alexithymia.

The object of these studies was to investigate the construct of alexithymia in the context of emotion processing. One important hypothesis has been largely confirmed, and due to the novelty of the methodology and the fact that the research was primarily exploratory in nature, the results of these studies have raised an enormous amount of expected and unexpected questions which may be addressed in future research. One unexpected finding was the difference in recognition for the separate emotions.

The data from this study lend support for the construct of alexithymia, which appears to be a continuum or personality trait, with people at the high end experiencing the greatest difficulty in discriminating among various negative emotions given temporal constraint. Alexithymia does appear to be a separate construct from negative affectivity. Alexithymics do appear to be 'fast-tracking' or crudely processing emotional information given temporal constraint.

Although most behavioural differences were found in the group most impaired in describing feelings, the demands of these studies were too limited to negate the validity of the other two TAS-20 factors in emotion processing. As already suggested in the introduction, these factors may complement one another and also reflect different stages of information processing. Clearly alexithymia is an important construct: important in shedding light on emotion processing as a whole, on consciousness and awareness, and on the interaction of affect, cognition and behaviour.

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Appendix A

The Toronto Alexithymia Scale-20 (TAS-20)

TAS - 20

Using the scale provided as a guide, indicate how much you agree or disagree with each of the following statements by circling the corresponding number. Give only one answer for each statement.

Circle 1 if you STRONGLY DISAGREE
Circle 2 if you MODERATELY DISAGREE
Circle 3 if you NEITHER DISAGREE NOR AGREE
Circle 4 if you MODERATELY AGREE
Circle 5 if you STRONGLY AGREE

	Strongly Disagree	Moderately Disagree	Neither Disagree Nor Agree	Moderately Agree	Strongly Agree
1. I am often confused about what emotion I am feeling.	1	2	3	4	5
2. It is difficult for me to find the right words for my feelings.	1	2	3	4	5
3. I have physical sensations that even doctors don't understand.	1	2	3	4	5
4. I am able to describe my feelings easily.	1	2	3	4	5
5. I prefer to analyze problems rather than just describe them.	1	2	3	4	5
6. When I am upset, I don't know if I am sad, frightened, or angry.	1	2	3	4	5
7. I am often puzzled by sensations in my body.	1	2	3	4	5
8. I prefer to just let things happen rather than to understand why they turned out that way.	1	2	3	4	5
9. I have feelings that I can't quite identify.	1	2	3	4	5
10. Being in touch with your emotions is essential.	1	2	3	4	5
11. I find it hard to describe how I feel about people.	1	2	3	4	5
12. People tell me to describe my feelings more.	1	2	3	4	5

	Strongly Disagree	Moderately Disagree	Neither Disagree Nor Agree	Moderately Agree	Strongly Agree
13. I don't know what's going on inside me.	1	2	3	4	5
14. I often don't know why I'm angry.	1	2	3	4	5
15. I prefer talking to people about their daily activities rather than their feelings.	1	2	3	4	5
16. I prefer to watch "light" entertainment shows rather than psychological dramas.	1	2	3	4	5
17. It is difficult for me to reveal my innermost feelings, even to my closest friends.	1	2	3	4	5
18. I can feel close to someone, even in moments of silence.	1	2	3	4	5
19. I find examination of my feelings useful in solving personal problems.	1	2	3	4	5
20. Looking for hidden meanings in movies or plays distracts from their enjoyment.	1	2	3	4	5

Appendix B

The Positive and Negative Affect Schedule (PANAS)

THE PANAS

This scale consists of a number of words that describe different feelings and emotions. Read each item, and then mark the appropriate answer in the space next to that word. Indicate to what extent you generally feel this way, that is, how you feel on the average. Use the following structure to record your answers.

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

____interested	____irritable
____distressed	____alert
____excited	____ashamed
____upset	____inspired
____strong	____nervous
____guilty	____determined
____scared	____attentive
____hostile	____jittery
____enthusiastic	____active
____proud	____afraid

Appendix C

Consent Form

Individual Characteristics Research Project

Information and Consent Form

Investigators: Philippa Parker and Ken Prkachin
Psychology Program, UNBC

We are conducting a study which will last approximately one hour. As a subject, you will be asked to read and sign this consent form, complete two questionnaires, and participate in three short experiments. In the experiments you will be shown visual material and you will be asked to indicate your response orally or by pressing a button. The order of presentation of the studies and completion of the questionnaires will vary for each student.

The two questionnaires ask you for information about individual characteristics. Psychologists often use such questionnaires to try to gain a better understanding of why people think, feel and act as they do. This present project is a follow-up to a pilot project conducted earlier this year. The object is to discover differences in responses to various situations.

The two questionnaires vary slightly in how you are asked to respond. Please read the instructions for both questionnaires carefully and then answer the questions to the best of your ability. You may find it difficult to answer some questions. Please try, to the extent that it is possible, to answer all items. However, if there are some that you truly cannot answer, or would prefer not to answer, you may leave them blank. The two questionnaires should take ten to fifteen minutes to complete.

Please be assured that all the information you provide will be kept in the strictest confidence. We do need to ask you some general information, such as your age, gender and student ID. However, once the tests are administered and the data entered, the actual questionnaires will be destroyed. The data will be stored anonymously, and each subject will have been allocated a unique number. Please be assured that your participation is voluntary, and that you are free to withdraw at any time.

Please indicate your consent to participate in this study by signing below.

I, _____, have read the foregoing information. I understand that my participation in this research project is voluntary and that I am free to withdraw at any time. I also understand that the information I provide will be treated in strict confidence. Based on these understandings, I hereby give my consent to participate.

_____	_____	_____	_____
Signature	Date	Student #	Gender